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Revision of the genus *Europteron* with description of *Europteron atlanticum*  
sp. n. from Morocco (Coleoptera: Scarabaeidae: Melolonthinae)

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**Abstract.** The pachydemine genus *Europteron* Marseul, 1867 is revised. Currently, three species are recognized: *E. gracile* Marseul, 1867, *E. confusum* Marseul, 1878 (both from Algeria) and *E. atlanticum* sp. n. from the Atlantic coast of Morocco. The new species differs from both of the previously known North African species mainly by remarkably densely punctate and setaceous clypeus, by all around setaceous pronotum, and by shape of metastibia and parameres. The female of *E. gracile* is described for the first time, females of *E. confusum* and *E. atlanticum* sp. n. are still unknown. *Europteron ibericum* Balthasar, 1929 is considered a junior objective synonym of *E. confusum*. Known distribution of all three species is mapped and their bionomy is discussed.

**Taxonomy, revision, new species, type designation, bionomy, distribution, Coleoptera, Scarabaeidae, Melolonthinae, Pachydemini, Palaearctic region**

#### INTRODUCTION

About 200 species of Pachydemini, belonging to 19 genera, are present in the Palaearctic region (Sabatinelli & Pontuale 1998). Almost 90 species in six genera are known from North Africa (Baraud 1979, 1985, 1987a, b). Moreover, another 15 endemic *Pachydema* species were described from the Canary Islands (Baraud 1994, Lacroix in press).

The genus *Europteron* Marseul, 1867 differs from all other North African Pachydemini by the simply acuminate apices of tarsal claws. The claws are apically bifid in the remaining North African genera: *Ceramida* Baraud, 1987; *Elaphocera* Géné, 1836; *Elaphocerida* Reitter, 1902; *Pachydema* Castelnau, 1832 and *Tanyproctus* Faldermann, 1835 (Baraud 1979, 1987a). Two North African members of the genus *Europteron* have been known so far: *E. confusum* Marseul, 1878 and *E. gracile* Marseul, 1867, both from Algeria (Baraud 1979), the latter species has been also recorded from Morocco (Ahrens & Zorn 1996). The third, distinctive new species is described in the present paper. The only European species has been described by Balthasar (1929) under the name *E. ibericum* from Valencia, Spain. However, several authors have expressed their doubt about the type locality and validity of the species (e.g., Báguena Corella 1967, Baraud 1977, 1992).

## MATERIAL AND METHODS

The following codes (after Arnett et al. 1993) identify the collections housing the material examined

ABCB – Czech Republic, České Budějovice, Aleš Bezděk collection;  
CZCD – Germany, Dresden, Carsten Zorn collection;  
DADC – Germany, Dresden, Dirk Ahrens collection;  
DKCC – France, Chartres, Denis Keith collection;  
DKCP – Czech Republic, Praha, David Král collection;  
JBCP – Czech Republic, Praha, Jan Batelka collection;  
JRCP – Czech Republic, Počábrady, Jiří Rejsek collection;  
MHNG – Switzerland, Genève, Muséum d'histoire naturelle (Ivan Löbl);  
MNHN – France, Paris, Muséum national d'Histoire naturelle (Claude Girard);  
NHMB – Switzerland, Basel, Naturhistorisches Museum (Eva Sprecher);  
NMPC – Czech Republic, Praha, National Museum (Josef Jelinek).

Specimens of the newly described species are provided with one printed red label: "Europteron atlanticum sp. n., HOLOTYPE or PARATYPE with No and male sex symbol, A. Bezděk, D. Král, D. Keith & M. Lacroix det. 1999". Exact label data are cited for the types only, separate labels are indicated by double slash (/). Authors' remarks and complementations are found in square brackets [p] – preceding data are printed, [h] – the same but handwritten, MS – manuscript; m – male(s), f – female(s).

## SYSTEMATIC PART

### *Europteron Marseul, 1867*

*Europteron* Marseul, 1867: 81; Reitter 1902: 96; Dalla Torre 1913: 302 (catalogue); Balthasar 1929: 41; Winkler 1929–1095 (catalogue); Báguena Corella 1967: 326; Baraud 1977: 283; 1979: 309; 1985: 394; 1992: 569.

**TYPE SPECIES.** *Europteron gracile* Marseul, 1867 (by monotypy).

**DIAGNOSIS.** Male. Small to medium-sized beetles (body length 5.0–8.5 mm). Body elongate, convex, dorsal surface shiny.

Clypeus feebly semioelliptic with distinctly upturned margin. Labrum small, narrow, flattened, hardly visible. Eye-canthus present, short. Frons bare. Antenna with ten antennomeres, club pentamerous, globular, distinctly shorter than antennal shaft. Terminal maxillary palpomere elongate, parallel, dorsally without excavation.

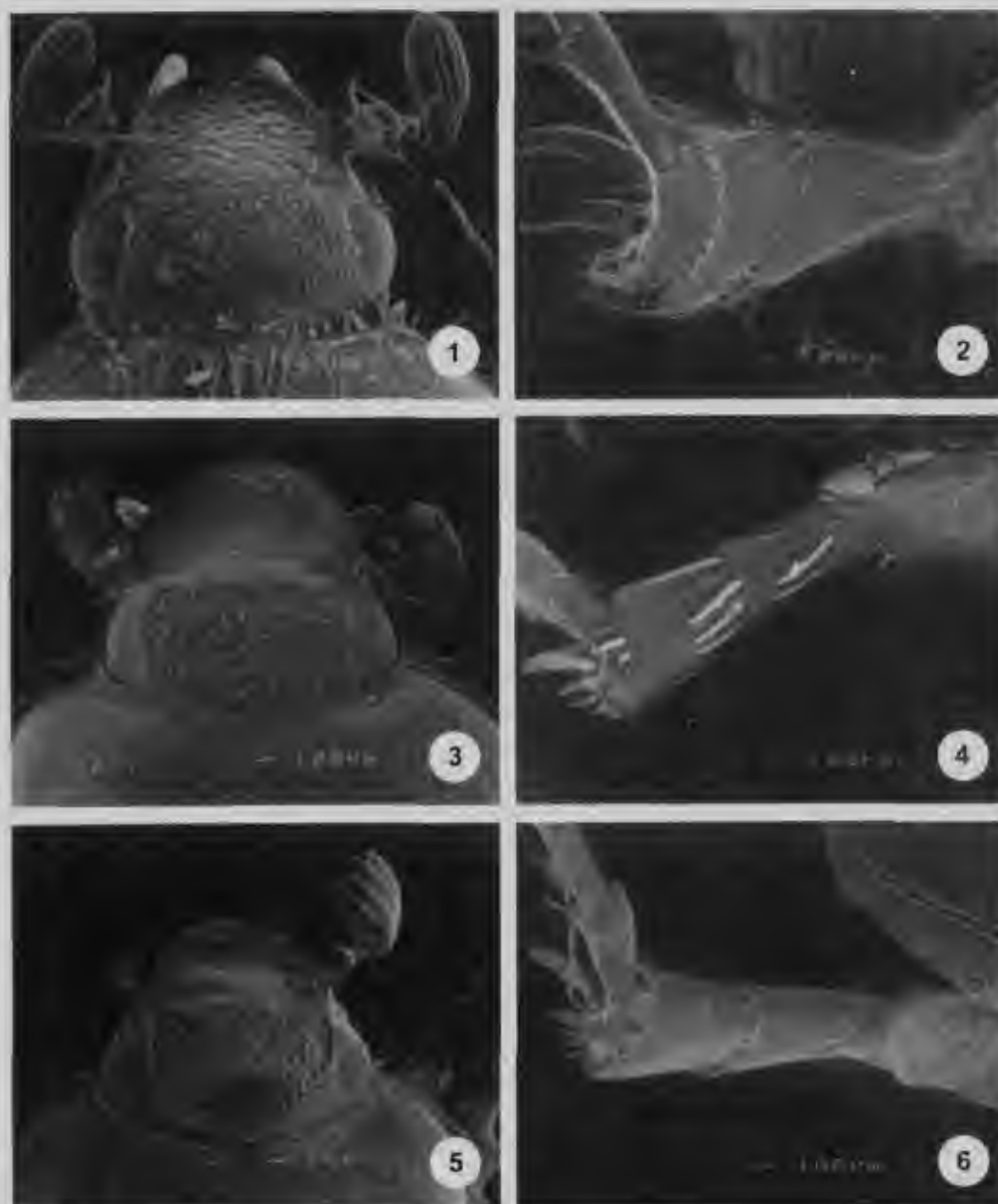
Pronotum convex, transverse; with all sides rimmed, anteriorly without membranous margin, lateral margin with row of long, erect setae. Elytron convex, rounded apically, bare; striae feeble or obsolete. Macropterous.

Protibia tridentate, basal dent in some specimens of *E. atlanticum* sp. n. almost obsolete. Terminal calcar slim, inserted against emargination between median and apical dents. Mesotibial calcars unequal. Posterior tibia short, widened apically, with medial transverse carina; terminal calcars slim, not dilated apically. Posterior femur remarkably short and stout. Tarsi elongate, tarsomeres simple, cylindrical, with bare ventral side. Claws long, equal, slim, ventrally not denticulate, simply acuminate apically (not bifid).

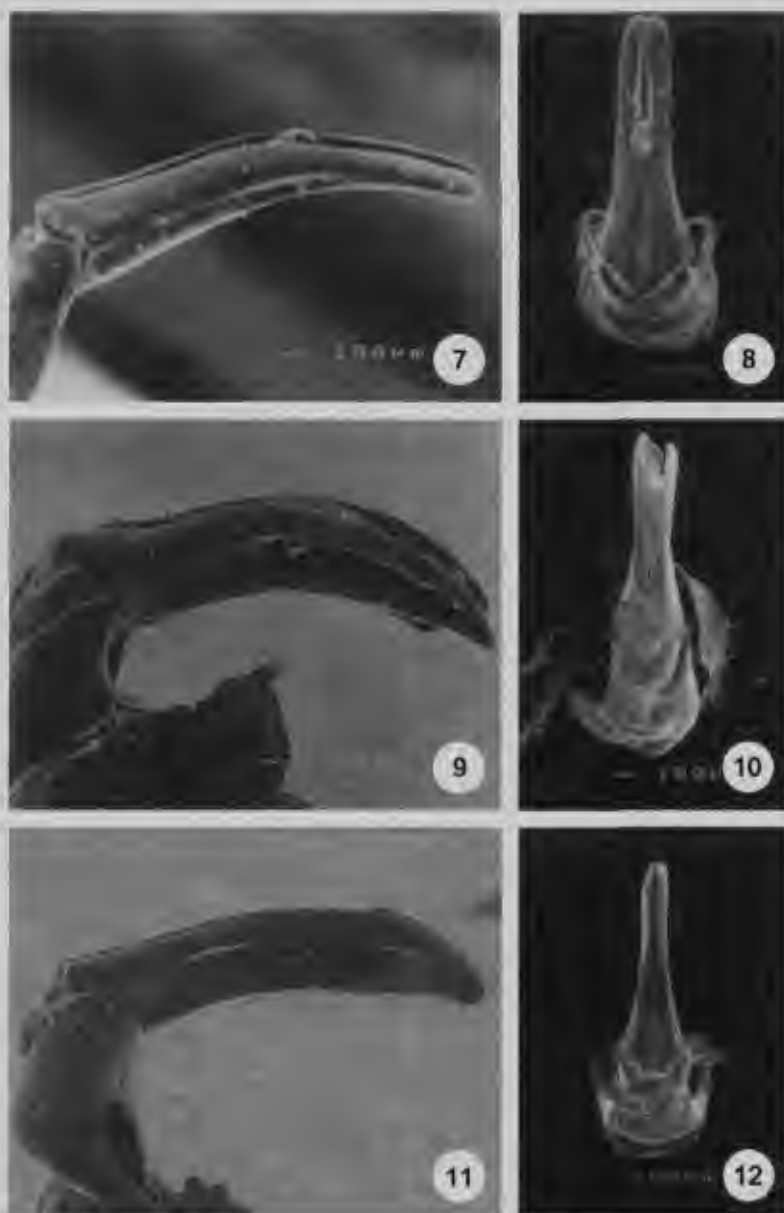
Pygidium short, rounded apically.

Sexual dimorphism distinctly pronounced in *E. gracile* (females of *E. confusum* and *E. atlanticum* sp. n. are still unknown); females remarkably larger and more robust than males (cf. Figs 13, 25), apterous, eyes much smaller, only slightly visible in dorsal aspect, minute anterior claws and lacking of terminal calcar of protibia.

**DISTRIBUTION.** North Africa: Morocco, Algeria; ? Spain.



Figs 1-6. Head (odd numerals) and posterior tibia (even numerals). *Eutetranychus atlanticus* sp. n. (paratype No. 2) (1-2), *E. confusus* Marseul (Algeria: Laphouit) (3-4), *E. gravis* Marseul (Algeria: El Golga) (5-6).



Figs 7-12. Lateral aspect (odd numerals) and dorsal aspect (even numerals) of parameres: *Eurypterus atlanticum* sp. n. (paratype No 2) (7-8); *E. confusum* Marseul (Algeria: Laghouat) (9-10); *E. gracile* Marseul (Algeria: El Goléa) (11-12).

***Europteron atlanticum* sp. n.**  
(Figs 1–2, 7–8)

*Europteron gracile* Ahrens & Zorn 1996: 11

**TYPE MATERIAL.** All males. Holotype and 14 paratypes Nos 1–14, labelled: Morocco 1997, AGLOU PLAGE, 7.5 [19]97, 15 km N of Tiznit, Batelka et Podroužková [Podroužková] lgt. [p]; 4 paratypes, Nos 15–18, labelled: Morocco 1998, Aglou Plage / 15 km NW of TIZNIT, 21.6.1998, Jan Batelka et Hana Batelková [Batelková] lgt. [p]. 2 paratypes, Nos 19, 20, labelled: MAROC 25 m, Tiznit 12 IV [19]99, Aglou-Plage, Keith & Olivier [lgt] [p]. 5 paratypes, Nos 21–25 labelled: SOUTH MOROCCO, Sidi Rbat/Qued Massa, 50 km S of Agadir, 24.III.[19]93, leg. C. Zorn [p]. 2 paratypes Nos 26, 27, labelled: Maroko – S.W., MASSA, Rejsek [lgt.], 10.5.1993 [p]. Holotype and paratypes Nos 1 and 20 in MNHN, paratypes Nos 2–4 and 25 in ABCB, paratypes Nos 5, 6 and 22, 23 in CZCD, paratypes Nos 7–9 and 24 in DKCP, paratypes Nos 10–14 in JBCP, paratypes Nos 15, 16 in NMPC, paratypes Nos 17, 18 in MHNG, paratype No 19 in DKCC, paratype No 21 in DACD; paratypes Nos 26, 27 in JRCF.

**ADDITIONAL MATERIAL EXAMINED** Morocco, **Mogador** [= Essaouira]: 1 m in MHNG (coll. R. Petrovitz)

**DESCRIPTION.** Body length 5.0–8.5 mm (holotype – 7.0 mm, 26 specimens measured). Body elongate, subparallel. Dorsal surface shiny, colour chestnut to dark brown, clypeus in some specimens paler than the rest of head, elytra yellowish with dark suture. Ventral surface shiny, chestnut to dark brown. Setation pale.

Head (Fig. 1). Clypeus semielliptic with distinctly upturned margin. Surface coarsely and densely punctate; punctures separated by approximately their diameter; surface covered with short, erect setae. Frontoclypeal suture absent. Vertex bare, finely and densely punctate. Eye-canthus with several long, erect setae; angle between lateral margin of clypeus and canthus obtuse. Antenna with ten antennomeres, antennomere 1, 2 and 3 elongate, antennomere 2 longer than antennomere 3, antennomere 4 and 5 strongly transverse, antennomere 1 and 2 covered with long, erect setae, antennomere 3–5 covered with short, erect setae; club pentamerous, distinctly shorter than antennal shaft. Terminal maxillary palpomere elongate, apically rounded, about twice as long as palpomeres 2 and 3 combined.

Pronotum convex, transverse, about twice as wide as long, widest approximately in anterior third, base broader than anterior margin; all sides distinctly rimmed with a row of long, erect setae; anterior and posterior angles obtusely angulate; anterior pronotal concavity almost lacking.

Scutellum semielliptic, slightly wider than long, posterior margin broadly rounded; finely and sparsely punctate.

Elytron convex, in basal half nearly parallel, narrowed apically; bare; punctation simple, irregular, coarse and dense; striae not indicated; lateral margin with a row of erect setae, that are distinctly shorter than those in marginal row of pronotum; sutural interval flat.

Ventral surface covered with moderately dense, long setae.

Protibia tridentate, basal dent in several specimens almost obsolete; terminal calcar slim, long, inserted against emargination between median and apical dents. Claws regularly curved, simply acuminate apically. Posterior femur short, broad, coarsely punctate. Posterior tibia (Fig. 2) short, stout, strongly dilated apically; apical transversal surface strongly convex; outer surface almost impunctate except several setae at base and two transversal setiferous rows of punctures; inner surface densely punctate, and covered with long, hair-like, erect setae. Both terminal calcars dorsally convex, ventrally flattened, and apically rounded.

Pygidium almost bare, only apical margin covered with a row of short setae. Pygidium with all sides rimmed, except medial part of basal margin, basal half sparsely punctate, with long erect setae, apical half impunctate.

Paramere (Figs 7–8) long, rounded apically, in lateral aspect remarkably narrow in apical third.



Female unknown.

DIFFERENTIAL DIAGNOSIS – see Table 1.

NAME DERIVATION. The specific name refers the geographical distribution (western part of Morocco, near the Atlantic Ocean) – see Fig. 26.

COLLECTION CIRCUMSTANCES. Specimens from Sidi Rbat were captured sitting on lower vegetation in a flower-rich dune habitat, at about 3 p. m. They were remarkably active (C. Zorn pers. comm.). Specimens from Tiznit (May 1997) were collected at dusk emerging from sand dunes, but no specimen has been collected at light; specimens from Tiznit (June 1998) were captured in flight above sand dunes at about midday (J. Batelka pers. comm.). Specimens from Tiznit (April 1999) were collected in the afternoon sitting on yellow flowers of Asteraceae. The weather was sunny and windy. Males of the species seem to be polliniphagous.

COMPLEMENTARY NOTE. The specimen from Mogador [= Essaouira], deposited in MHNG is a male, but its abdomen is somewhat damaged and the aedeagus is missing. Therefore the authors have decided to exclude this specimen from the type series.

DISTRIBUTION. Morocco: Aglou Plage – type locality, Sidi Rbat, Mogador (this paper).

### *Europteron confusum* Marseul, 1878

(Figs 3–4, 9–10)

*Europteron confusum* Marseul, 1878: 60; Reitter 1902: 96; Dalla Torre 1913: 302 (catalogue), Winkler 1929: 1095 (catalogue); Baraud 1979: 310; 1985: 396.

*Europteron ibericum* Balthasar, 1929: 41 (type locality: Valencia); Báguena Corella 1967: 326, Baraud 1977: 283, 1992: 570, *syn. n.*

TYPE LOCALITY. Laghouat (Marseul 1878).

TYPE MATERIAL EXAMINED. *Europteron confusum*. Lectotype (m, length 7.0 mm), labelled: *Europteron confusum* Laghouat 78 [blue round label, h] // J. B. Laghouat [green round label, h] // *confusum* M. Ab 16 60 Alg // Lectotype // *Europteron confusum* Marseul, M. Lacroix det. 1999, in MNHN [designated as holotype by Baraud (1979)]. *Europteron ibericum*. Holotype (m), labelled: Valencia Hispania [p] // Typus [red label, p] // *Europteron ibericum* m [Balthasar's MS] // *Europteron ibericum* Balthasar, 1929 HOLOTYPE David Král det. 1999 [red label, p] // *Europteron confusum* Marseul, 1878 David Král det. 1999 [p], in NMPC (coll. V. Balthasar).

ADDITIONAL MATERIAL EXAMINED. **Algeria, Biskra:** Dumont [lgt.], 1 m in MNHN (coll. P. Peyerimhoff); **Brezina:** 70 km mer. El Bayadh, 850 m, June 5, 1986, Brezina [lgt.], 1 m in DKCP; **El Goléa:** February 1919, Sureau [lgt.], 4 m in MNHN (coll. P. Peyerimhoff); **Laghouat:** J. Dayreux [lgt.], 1 m in MHNG, 7 m in MNHN (coll. A. Chobaut), 2 m in MNHN (coll. A. Demareux), 1 m in MNHN (coll. R. Demoflys), 32 m in MNHN (coll. R. Oberhäuf), 5 m in MNHN (coll. M. Pic), 2 m in NHMB, 2 m in NMPC; **Zirara:** El Goléa env., November 1918, Sureau [lgt.], 1 m in MNHN (coll. P. Peyerimhoff).

DIAGNOSIS. For the diagnosis see Table 1.

COMPLEMENTARY NOTES. Specimen designated as “holotype” of *E. confusum* by Baraud (1979) is in fact the lectotype (see Article 74 (b) in the ICZN 1985).

The description of *E. ibericum* was based on one specimen from Valencia, Spain (Balthasar 1929). One of the authors (D. Král) has examined type specimen (male) of *E. ibericum*, which is deposited in NMPC. This specimen is without any doubt conspecific with *E. confusum*.

DISTRIBUTION (Fig. 26). **Algeria:** Laghouat – type locality (Marseul 1878; repeated by Reitter 1902, Baraud 1979, 1985); Biskra, Brezina, El Goléa, Zirara [El Goléa env.] (this paper). The type locality of *E. ibericum*, Spain: Valencia (Balthasar 1929), seems to be doubtful, and is probably based on a mislabelled specimen (see Discussion).



***Europteron gracile* Marseul, 1867**

(Figs 5–6, 11–25)

*Europteron gracile* Marseul, 1867: 81; Reitter 1902: 96; Dalla Torre 1913: 302 (catalogue); Winkler 1929: 1095 (catalogue); Kocher & Reymond 1954: 222; Théron & Hollande 1965: 871; Baraud 1979: 309; 1985: 395.

*Europteron Bayonneti* Chobaut, 1896: 413 (type locality: Ghardaïa); Reitter 1902: 96 (syn. to *E. gracile*); Dalla Torre, 1913: 302 (catalogue); Winkler 1929: 1095 (catalogue).

*Europteron bayonneti* Baraud 1979: 309 (syn. to *E. gracile*, lectotype designation), 1985: 395 (syn. to *E. gracile*).

**TYPE LOCALITY.** Ouargla (Marseul 1867).

**TYPE MATERIAL EXAMINED.** *Europteron gracile*. Lectotype (m, length 6.0 mm), labelled: *Callienemis* sp. n., [illegible word], Ouargla dte 67 [blue round label, h] // *Pachydema* ou *Callienemis* [rectangular label, h] // bte Marseul n° 37 [h] // *gracile* Mars. Ab. 67 '81' Ouargl[a] [h] // *Europteron* Mars Ab 67. 82' [blue round label, h] // Museum Paris Col. Marseul [p] // Holotype [Baraud's label] // Lectotype // *Europteron gracile* Marseul, M. Lacroix det. 1999, in MNHN (coll. S. A. Marseul) [specimen designated as holotype by Baraud (1979)]. *Europteron bayonneti*. Lectotype (m, length 6.0 mm), labelled: Ghardaïa Dr. Chobaut // Type // *Europteron* Chob. Bayonneti Chob. [Chobaut's MS] // Lectotype // *Europteron bayonneti* Chobaut, M. Lacroix det. 1999, in MNHN (coll. A. Chobaut) [lectotype designated by Baraud (1979)].

**ADDITIONAL MATERIAL EXAMINED.** **Algeria, Béni Abbès:** 1936, Dr. Ducros [lgt.], 1 m in MNHN (coll. P. Peyerimhoff); March 1947, swimming-pool, Raymond lgt., 3 m and 2 f in MNHN (coll. P. Peyerimhoff); Saoura, April 1960, 3 m in MNHN (coll. A. Hollande); 27.–28.iv.1987, David Král lgt., 1 m in ABCB, 17 in DKCP; **El Goléa:** 1934, L. Chopard [lgt.], 2 m in MNHN; May 1942, R. Paulian [lgt.], 19 m in MNHN; 29.–30.iv.1987, D. Král lgt., 4 m in ABCB, 32 m in DKCP; **Ghardaïa:** May 1897, 5 m in MNHN (coll. L. Bodol), 748 m in MNHN (coll. A. Chobaut); 15 m in MNHN (coll. L. Fairmaire); 1 m in MNHN (coll. R. Oberthür); 2 m in MNHN (coll. A. de Perrin); 3 m in MNHN (coll. A. Pulton); 1 m in NMPC (coll. V. Balthasar); Dr. Chobaut [lgt.], 3 m in MNHN (coll. A. Chobaut); 1 m in NHMB (coll. G. Frey); **M'zab:** 3 m in MHNG, 4 m in NHMB (coll. G. Frey); 2 m in NMPC, 3 m in NMPC (coll. V. Balthasar); **Timimoun:** 28.–29.iv.1987, D. Král lgt., 1 m in ABCB, 3 m in DKCP.

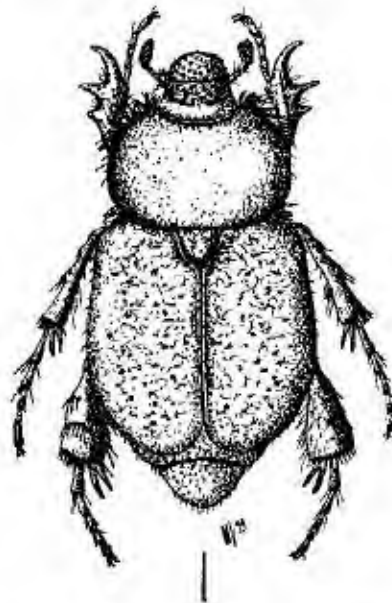
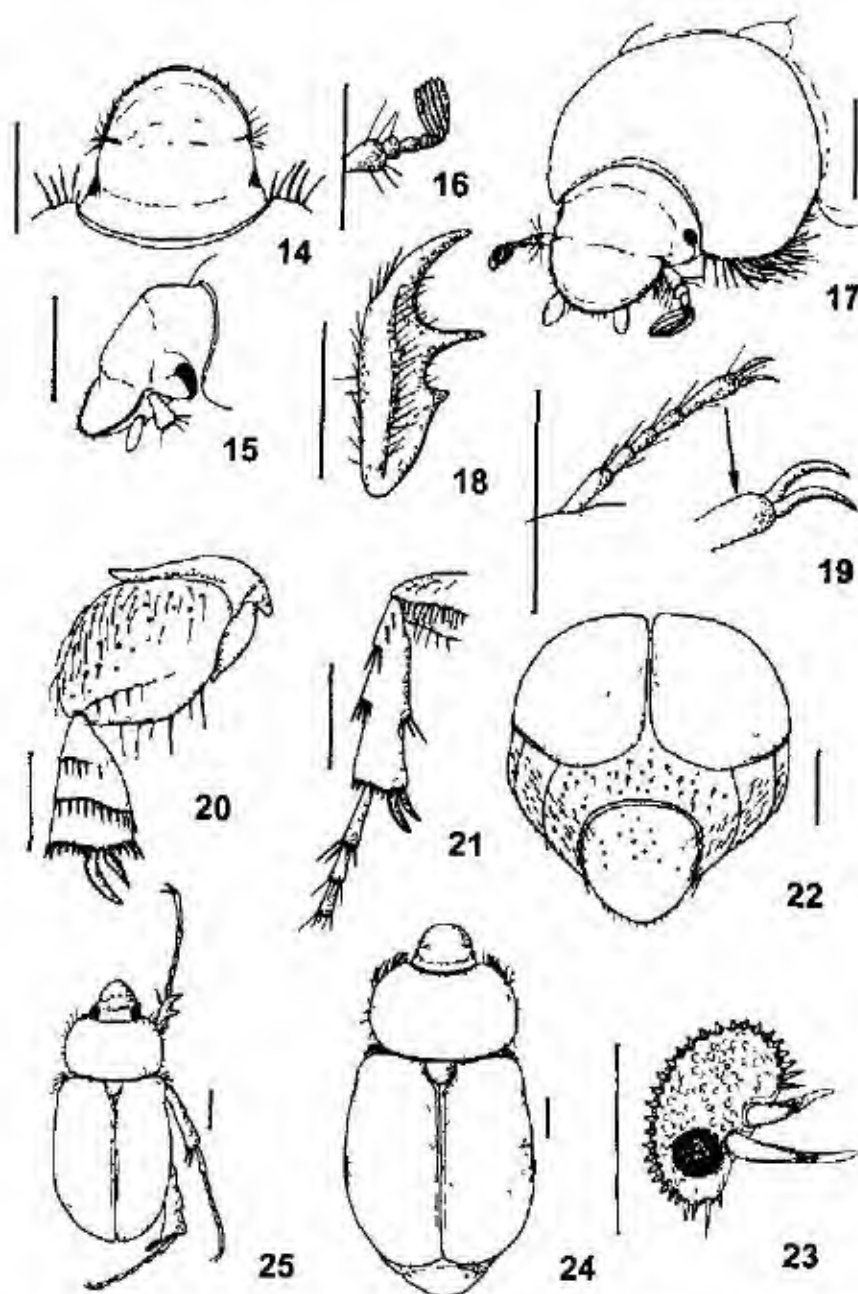


Fig. 13. *Europteron gracile* Marseul (Algeria: Béni Abbès), female habitus (drawing by M. Lacroix).



Figs 14-25. *Euopiron gracile* Marseul (Algeria: Beni Abbes), female (14-24), male (25). 14 - head, dorsal view, 15 - head, lateral view, 16 - antenna, 17 - head and pronotum, 18 - protibia, 19 - protarsus and claws, 20 - metafemur and metatibia, 21 - mesotibia, 22 - propygidium and pygidium, 23 - apex of metatibia with spurs, 24 - schematic shape of the body, 25 - schematic shape of the body (drawings by M. Lacroix). Scale = 1 mm.

Tab. 1 Character matrix for separation of males of the species of the genus *Europteron* Marscul

character	<i>E. atlanticum</i> sp. n	<i>E. confusum</i>	<i>E. gracile</i>
body length	5.0-8.5 mm	6.5-7.0 mm	4.5-7.5 mm
colour	head and pronotum chestnut to dark brown, elytra yellowish	head and pronotum dark brown, elytra chestnut to dark brown	unicolorous, yellowish brown
clypeus	coarsely and densely punctate and setaceous (Fig. 1)	with several shallow punctures, bare (Fig. 3)	with several shallow punctures, bare (Fig. 5)
shape of clypeus	semielliptic	ogival	ogival
frons	flat	flat	deflexed in the middle
vertex	finely densely punctate	remarkably rugose	remarkably rugose
terminal maxillar palpomere	apically rounded	apically feebly acuminate	apically feebly acuminate
anterior pronotal concavity	almost lacking	almost lacking	distinctly impressed
anterior and posterior pronotal margin	setaceous	bare	bare
pronotum	coarsely and densely punctate	coarsely and sparsely punctate	finely and sparsely punctate
scutellum	wider than long	as wide as long	as wide as long
punctuation of elytron	simple, coarse and dense	double, coarse and dense	double, fine and dense
sutural interval of elytron	flat	remarkably convex	flat
protibia	tridentate, basal dent obsolete	tridentate	tridentate
metafemur	coarsely punctate	almost impunctate	almost impunctate
shape of metatibia	apical transversal surface strongly convex (Fig. 2)	apical transversal surface more or less flat (Fig. 4)	apical transversal surface more or less flat (Fig. 6)
claws	shorter, regularly curved	shorter, regularly curved	remarkably long, curved in apical third only
paramere	in lateral aspect remarkably narrow in apical third (Fig. 7)	in lateral aspect not remarkably narrow (Fig. 9)	in lateral aspect not remarkably narrow (Fig. 11)

DESCRIPTION OF FEMALE (Fig. 13). Body length 9.0 mm (2 specimens measured). Body robust, broad, with rounded sides (Fig. 24). Dorsal surface moderately shiny, bare, reddish brown. Apterous.

Head. Clypeus large, subsemicircular, anterior margin with a median, minute, acute point. Clypeus and frons densely and rugosely punctate; vertex finely punctate. Frontoclypeal suture incomplete, in the middle broadly interrupted (Fig. 14). Eye-canthus wide (Fig. 15); eyes very small, hardly visible from above. Antenna with ten antennomeres, antennomeres 1 and 3 elongate, antennomere 2 trapezoidal, antennomeres 4 and 5 strongly transverse, club pentamerous, distinctly shorter than antennal shaft, antennomere 10 shorter than antennomeres 6-9 combined (Fig. 16). Terminal maxillary palpomere broad (Fig. 17).

Pronotum convex, all sides distinctly rimmed, lateral sides with a row of long erect setae (Fig. 17). Surface of pronotum moderately densely and finely punctate. Anterior pronotal concavity indistinct.

Scutellum semielliptic, with rounded apex (Fig. 13).

Elytron convex, bare; sutural interval elevated. Apex of elytron broadly rounded (Fig. 22).

Protibia tridentate, basal dent very distinct, median and apical dents long, with acute apex; terminal calcar absent (Fig. 18). Anterior tarsus short, with very minute claw (Fig. 19). Mesotibia

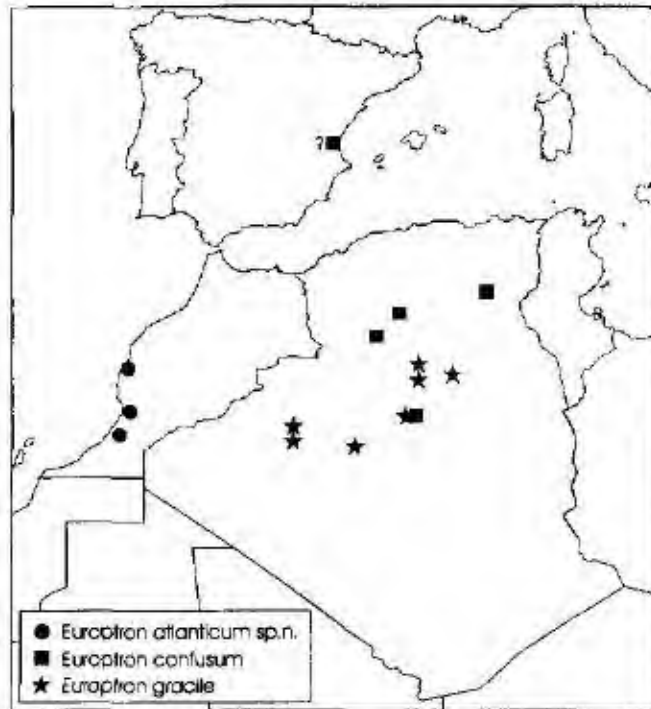


Fig. 26 Map of distribution of the genus *Europteron* Marseul. Question mark indicates the type locality of *E. ibericum* Balthasar.

elongate, median tarsus with basotarsomere longer than tarsomeres 2 and 3 combined. Posterior femur short, globular (Fig. 20). Metatibia very short, strongly dilated apically, both terminal calcaria flat (Fig. 23). Posterior tarsus short, with tarsomeres moderately enlarged.

Propygidium exposed, densely punctate and covered with short setae (Fig. 22).

DIAGNOSIS. For the diagnosis see Table 1.

COLLECTION CIRCUMSTANCES. All specimens (males) collected by D. Král were captured at night, attracted by the street illuminance in intravillan of the oases mentioned. All three localities are surrounded by sand dunes.

COMPLEMENTARY NOTE. Specimen designated as "holotype" of *E. gracile* by Baraud (1979) is in fact the lectotype (see Article 74 (b) in the ICZN 1985).

Ahrens & Zorn (1996) recorded *E. gracile* from Morocco on the basis of several specimens collected in Sidi Rbat. The authors examined these specimens and found, that all of them belong in fact to *E. atlanticum* sp. n.

DISTRIBUTION (Fig. 26). Algeria: Ouargla – type locality (Marseul 1867; repeated by Reitter 1902 [as l'Quargla], Thérond & Hollande 1965, Baraud 1979, 1985), Béni Abbès (Thérond & Hollande 1965), Ghardaïa (Chobaut 1896 – type locality of *E. bayonnei*, Baraud 1985), El Goléa, Metlili (Baraud 1985), Ougarta (Kocher & Reymond 1954), M'zab [Ghardaïa env.], Timimoun (this paper).

## DISCUSSION

While *Europton gracile* seems to be a typical nocturnal species, *E. atlanticum* sp. n. apparently exhibits true diurnal activity. Lacroix (1994) mentioned a similar diurnal activity for *Canudemana socotrae* Lacroix, 1994 and *Eucyclophylla namaqua* Evans, 1987. However, he states that this kind of behaviour is not common in Pachydemini, which are mainly crepuscular or nocturnal insects and good flyers that are mostly captured at light.

This assertion should be somewhat revised: during the same trip when paratypes of *E. atlanticum* sp. n. Nos 19–20 were captured, a large series of *Pachydema anthracina* Fairmaire, 1860 was found near Essaouira during day-time. Two females were observed feeding on yellow flowers of small plants of the family Brassicaceae, while males were flying around near the ground searching for females. Females showed an evident erratic behaviour; they seemed to be emitting pheromones to attract males, and often a single female sitting on the grass was surrounded by several males. From the zoogeographical point of view, both of the previously known *Europton* species (*E. gracile* and *E. confusum*) are typical Sahara elements, that are highly probably confined to sand dunes covered with sparse vegetation (localities Béné Abbès, El Goléa and Timimoun). Both species are absent from the sea shore dunes in the whole African Mediterranean area. For this reason, the record from Valencia (Balthasar 1929 as *E. ibericum*) is most probably based on a mislabelled specimen. On the other hand, *E. atlanticum* sp. n. seems to be closely tied with sea shore dunes of the Atlantic Sea in Morocco and it seems to be endemic for this region like several other scarabaeid species, e.g., *Amphimallon insculptum* Brenske, 1889; *Pachydema emflusi* Escalera, 1914 and *Honoriella elaphoceroideus* Escalera, 1914.

## Acknowledgements

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## Subspecific taxonomy of *Leistus montanus* from Central Europe (Coleoptera: Carabidae: Nebriini)

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**Abstract.** Three new subspecies of *Leistus* (*Pogonophorus*) *montanus* Stephens, 1827 are described and illustrated: *L. (P.) montanus caroticus* ssp. n. from Krkonoše Mts. (= Giant Mts.), bordering Bohemia and Poland, *L. (P.) montanus kultianus* ssp. n. from Bohemia and Germany, and *L. (P.) montanus pavlovskii* ssp. n. from Babia Góra Mts., bordering southern Poland and northwestern Slovakia. *L. montanus* is for the first time recorded from Slovakia.

**Taxonomy, descriptions, new subspecies, Coleoptera, Carabidae, *Leistus montanus*, Czech Republic, Germany, Poland, Slovakia**

### INTRODUCTION

The present subdivision of the genus *Leistus* Frölich, 1799 was published by Perrault (1980, 1982, 1992). In this concept, the subgenus *Pogonophorus* Latreille, 1802 contains several taxa, of which three species groups have to be taken into consideration for central Europe: *L. spinibarbis*-group, *L. rufomarginatus*-group and *L. ovipennis*-group (sensu Perrault 1982). The *L. spinibarbis*-group contains, in addition to the species previously assigned to the subgenus *Oreobius* K. Daniel, 1903 (*L. apfelbecki* Ganglbauer, 1892, *L. glacialis* Fiori, 1899, *L. gracilis* Fuss, 1860, *L. imitator* Breit, 1914, *L. noesskei* Bänninger, 1931, *L. punctatissimus* Breit, 1914, *L. pyrenaeus* Kraatz, 1863, *L. rousi* Pulpán et Reška, 1977, and *L. ucrainicus* Lazorko, 1954), the species *L. spinibarbis* (Fabricius, 1775), *L. magnicollis* Motschulsky, 1865 and the complex of *L. montanus* (see Assman 1993, Horvátovich 1971 and Perrault 1991, 1992). Recently, the following taxa are assigned to the latter complex as separate species: *L. parvicollis* Chaudoir, 1869, *L. puncticeps* Fairmaire et Laboulbène, 1854 and *L. montanus* Stephens, 1828.

### MATERIAL AND METHODS

This study is based on 914 specimens of *Leistus montanus* from 66 private and public collections. When referring to these collections in the text, the following abbreviations are used:

eBER – collection of Radek Beran (Liberec, CZ); eBUL – collection of Petr Bulirsch (Lovosice, CZ); eČER – collection of Zdeněk Černý (Mirovice, CZ); eČRV – collection of Radek Červenka (Praha, CZ); eDVO – collection of Miroslav Dvořák (Praha, CZ); eFAR – collection of Jan Farkač (Praha, CZ); eFRE – collection of Frey (Naturhistorisches Museum Basel, CH); eFSS – collection of †Miloš Fassati (Muséum d'histoire naturelle Genève, CH); eGEB – collection of Jörg Gebert (Rohre, D); eGTT – collection of Josef Gottwald (Naturhistorisches Museum Basel, CH); eHÁV – collection of Jiří Háva (Praha, CZ); eHEI – collection of Walter Heinz (Schwanfeld, D); eHEJ – collection of Jiří Hejkal (Kraslice, CZ); eHON – collection of Miroslav Honeš (Česká Lipa, CZ); eHOV – collection of Oldřich Hovorka (Dobruška, CZ); eHÚR – collection of Karel Hůrka (Praha, CZ); eCHV – collection of Jiří Chvátkovský (Česká Lipa, CZ); eJAN – collection of Miroslav Janata (Praha, CZ); eJAR – collection of Miloš Jaroš (Litoměřice, CZ); eJUR – collection of Josef Juráček (Praha, CZ); eKAB –



collection of Petr Kabátek (Praha, CZ), **eKAŠ** – collection of Ludvík Kašpar (Česká Lípa, CZ), **eKLI** – collection of Libor Klíma (Ostrava, CZ), **eKME** – collection of Rudolf Kmeč (Litovel, CZ), **eKOV** – collection of Milan Kovařík (Praha, CZ), **eKRA** – collection of David Kral (Praha, CZ), **eKUČ** – collection of Pavel Kučera (Liberec, CZ), **eLAK** – collection of Jan Lakota (Hriňová, SK), **eLIN** – collection of Martin Linhart (Praha, CZ), **eLOH** – collection of Roman Lohaj (Košice, SK), **eMKA** – collection of Zdeněk Malinka (Opava, CZ), **eMAL** – collection of Vladislav Malý (Praha, CZ), **eMAR** – collection of Ivan Mareček (Praha, CZ), **eMGG** – collection of Werner A. Margg (Thun, CH), **eMHG** – collection of Muséum d'histoire naturelle Genève (CH), **eMLE** – collection of Roman Mlejnek (Pardubice, CZ), **eJMO** – collection of Josef Moravec (Vrúty, CZ), **ePMO** – collection of Pavel Moravec (Litoměřice, CZ), **eNBA** – collection of Naturhistorisches Museum Basel (CH), **eNMB** – collection of Naturhistorisches Museum Bern (CH), **eNMP** – collection of Národní Muzeum Praha (CZ), **ePLU** – collection of Andrey Plutenko (Smolensk, RU), **ePRO** – collection of Jaroslav Prouza (Hradec Králové, CZ), **ePUL** – collection of Jan Pulpan (in collection of Vladimír Skoupy (Žilina u Kladna, CZ)), **eREJ** – collection of Martin Rejzcek (Praha, CZ), **eREB** – collection of Karel Rebl (Nové Strašecí, CZ), **eROL** – collection of Jakub Rolák (Praha, CZ), **eSCH** – collection of Jan Schneider (Praha, CZ), **eSCI** – collection of Riccardo Sciacchi (Milano, I), **eSKO** – collection of Vladimír Skoupy (Žilina u Kladna, CZ), **eSLZ** – collection of Tomáš Scholz (České Budějovice, CZ), **eSMD** – collection of Staatliches Museum für Tierkunde Dresden (D), **eSME** – collection of Alš Smetana (Ottawa, CND), **eSMN** – collection of Staatliches Museum für Naturkunde Stuttgart (D), **eSTA** – collection of Jiří Stanovský (Ostrava, CZ), **eSTO** – collection of Stobieski Instytut Zoologii P.A.N. Krakow, PL), **eSTR** – collection of Jaromír Štejíček (Praha, CZ), **eTĚT** – collection of Ivo Těfal (Píseň, CZ), **eVES** – collection of Petr Veselý (Praha, CZ), **eVON** – collection of Pavel Vonička (Liberec, CZ), **eWRA** – collection of David W. Wrase (Berlin, D), **eZIE** – collection of Vladimír Zieris (Pardubice, CZ), **eZMB** – collection of Moravské zemské muzeum Brno (CZ), **eZSM** – collection of Zoologische Staatssammlung München (D), **eZUB** – collection of Miroslav Zuber (Košmonosy, CZ), **eZVA** – collection of Bohdan Zvaně (Lovanice, CZ)

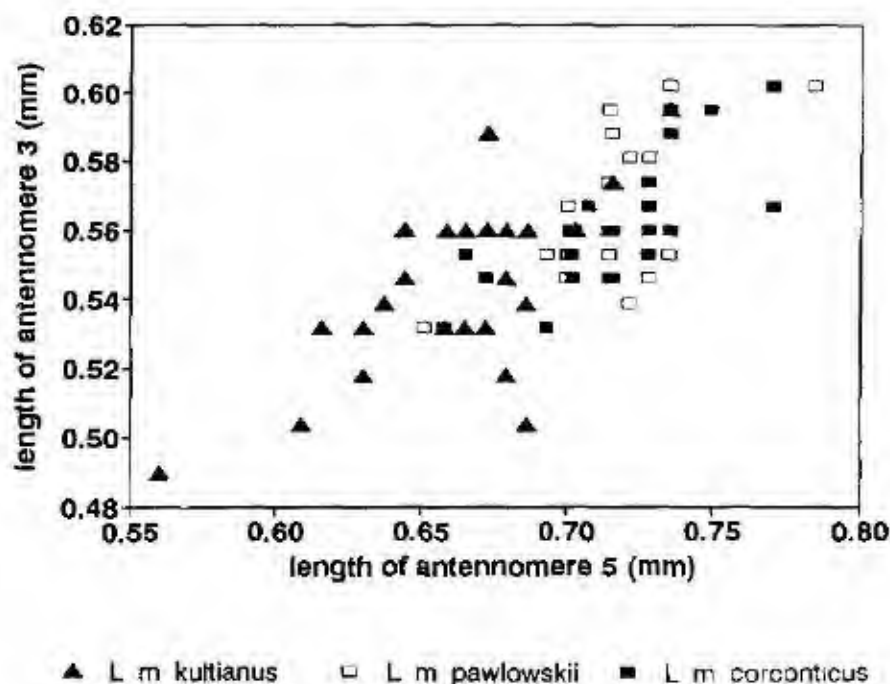


Fig. 1. Antennal index = length of antennomere 5/length of antennomere 3 (IA)

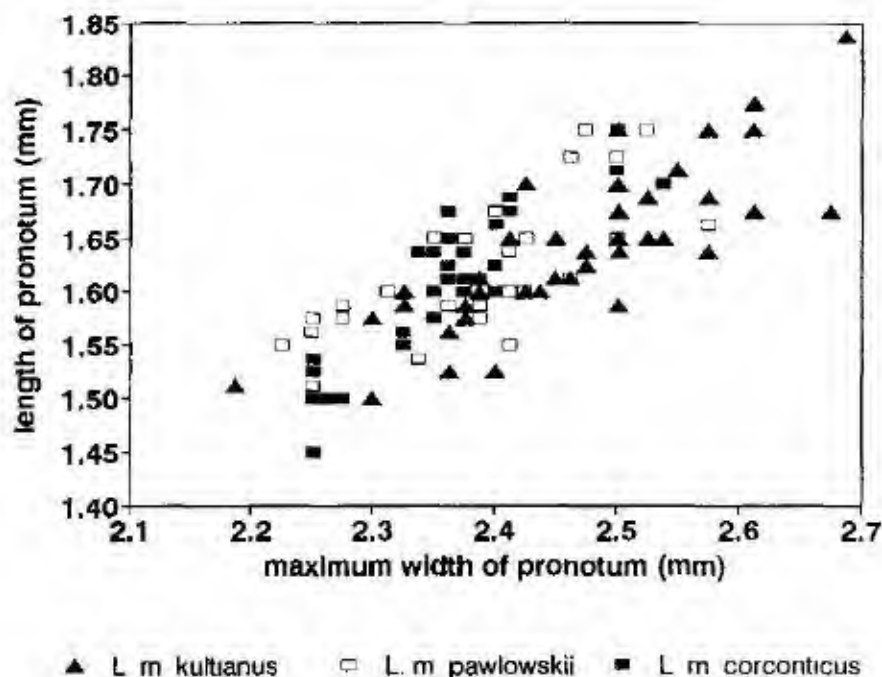


Fig. 2. Pronotal index: maximum width/length of pronotum ( $lpw/l$ )

In the descriptions of the subspecies, we have used several indexes. They are listed below, including their abbreviations used in the text.

$IA$  = antennal index: length of antennomere 5/length of antennomere 3 (Fig. 1).

$lpw/l$  = pronotal index: maximum width/length of pronotum (Fig. 2).

$lpm/b$  = pronotal index two: maximum width of pronotum/basal width of pronotum (Fig. 3).

$IE/P$  = elytral pronotal index: combined width of elytra/maximum width of pronotum (Fig. 4).

$lel/w$  = elytral index: length/combined width of elytra (Fig. 5).

For the establishment of the morphometric data and for calculations of the indexes mentioned above, 15 male and 15 female specimens were measured for *L. montanus corconticus* ssp. n. and *L. montanus pawlowskii* ssp. n., and 20 males and 20 females for *L. montanus kultianus* ssp. n.

Czech localities are followed, in square brackets, by a four-digit number of the cartographic field for the net-mapping of the fauna (Pruner & Mika 1996, see also Fig. 6). Slovak localities are according to the list of the localities and their codes for the net-mapping of the entomofauna of Czechoslovakia (Novak 1989, see also Fig. 6).

In the paragraph "Activity", the absolute numbers of males and females are given for each month of occurrence, as they were established from the locality labels of the specimens studied.

#### SYSTEMATIC PART

Our concept of *Leistus* (*Pogonophorus*) *montanus* Stephens, 1828 agrees with that of Perrault (1980, 1982, 1992). The species is distributed from Great Britain to Central Europe. Within this range,

it forms several more or less isolated groups of populations, which we characterize in the following text as subspecies.

Records of the occurrence and distribution of *Leistus montanus* in Europe are confusing due to the uncertainty in delimiting the two species *L. spinibarbis* and *L. montanus*, as well as to erroneous determinations in the past. Only after the positive delimitation of the two species by Perrault (1982), using the ratios of the maximal width of head (including eyes), of the width of the base of the pronotum and of the width of the base of the elytra, it became possible to positively evaluate the available records, and/or to revise doubtful material. At present, there is no doubt that *L. spinibarbis* does not occur on the territory of the Czech and Slovak Republics, since there are no reliable records available (e.g., Kult 1941: 16; 1947: 43; Hůrka 1996: 48–49).

Numerous authors document the occurrence of *L. montanus* on Czech lands, mostly from the screes of České středohoří Mts. (e.g., Veselý 1954: 420, Hůrka 1973: 24, 77, Srejšek 1973: 57, Pulpán & Táborský 1983: 9, Vysoký 1984: 83, Vysoký 1989: 26, Benedikt & Těřál 1994: 16, Moravec 1995: 39, Veselý & Těřál 1998: 100). Other important Czech localities include Jince and Dobříš (Roubal 1926: 106), Praha-Hlubočepy (Pulpán 1957: 83), Praha-Řeporyje, Mareček lgt. (Benedikt & Těřál 1994: 16), Nehvizdy (e.g., Dvořák 1962: 4) [the locality was destroyed by bulldozing]. Pičman (1979: 105) and Havelka (1985: 31) described the habitat as rocky screes in a quarry and confirmed the disappearance of the species due to the subsequent destruction of the habitat. Further records include the natural reserve Baba in Křivoklát area (Šmaha 1982: 141, 151), the castle Česká Kamenice in Česká Lípa area (Honcū & Pulpán 1975: 103), and Stráž nad Ohří and Průčelská rokle (gorge) near Ústí nad Labem (Veselý & Těřál 1998: 100).

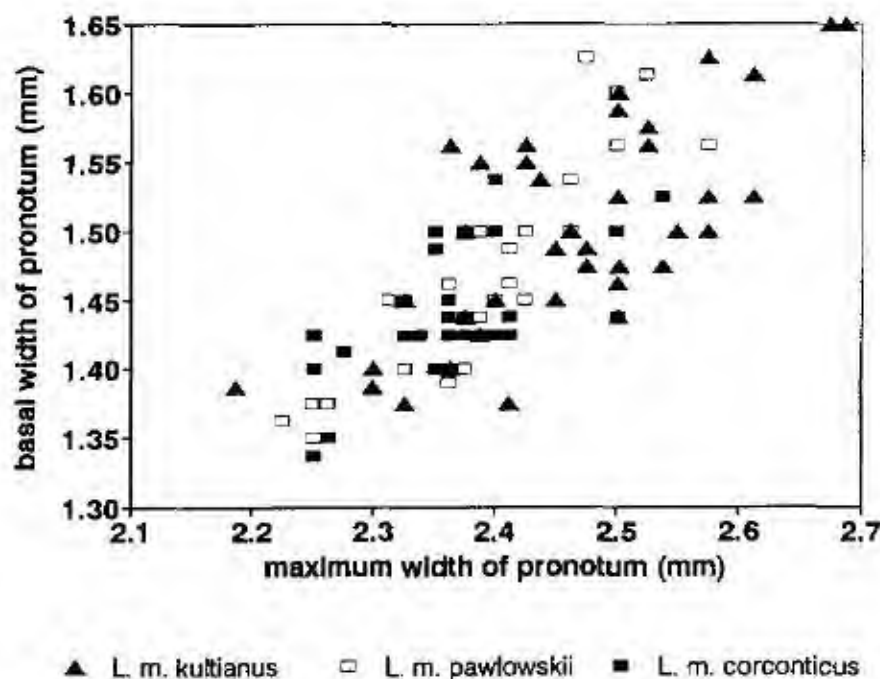


Fig. 3. Pronotal index two; maximum width of pronotum/basal width of pronotum (lpm/b).

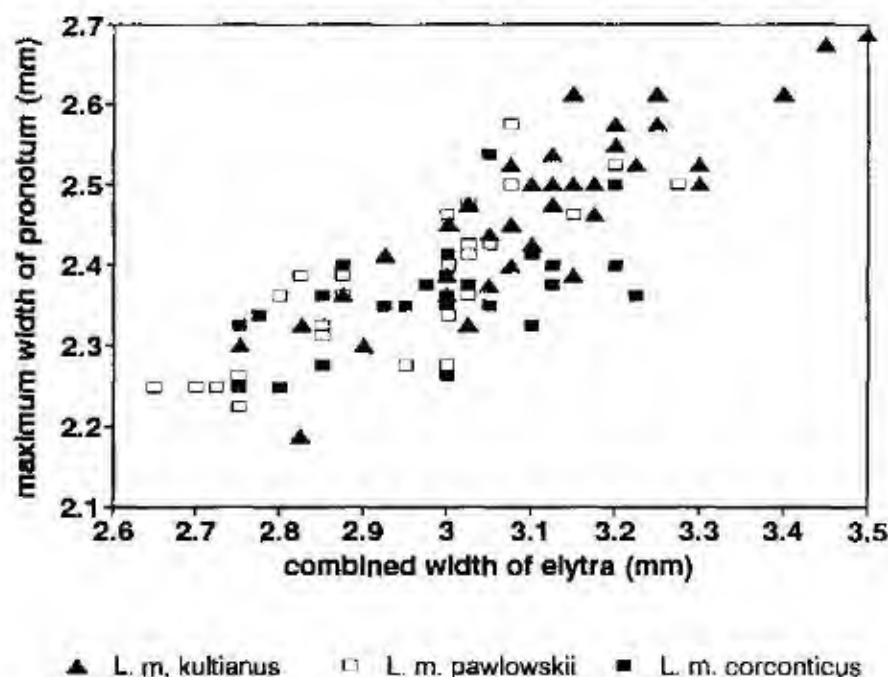


Fig. 4. Elytral-pronotal index: combined width of elytra/ maximum width of pronotum (IE/P).

Records from Krkonoše were published e.g., by Letzner (1871: 11), Leder (1872: 88), Letzner (1885–1891: 7) gives five localities (Koppenhegel, Teichränder, Vysoké Kolo, edges of Sněžné Jámy, Weigelstein), Schubert (1904: 15) records the species from Schwarze Koppe, Veselý (1954: 420), Pulpán (1957: 83) from Vysoké Kolo, Obenberger (1952: 182) repeats the occurrence on Vysoké Kolo and Sněžné Jámy, Noskiewicz et al. (1961: 36) present records from Velký Šišák and Sněžné Jámy, and Martiš (1975: 120–121) and Pičman (1979: 105) from Vysoké Kolo. Hůrka (1958: 42) records it from Sněžka, Vysoké Kolo and Sněžné Jámy, Martiš (1972: 40) from Vysoké Kolo and from the vicinity of Labská bouda, Benedikt & Těšál (1994: 16) from the vicinity of Sněžné Jámy, and Veselý & Těšál (1998: 100) from Vysoké Kolo. Dvořák (1962: 4) mentions the occurrence in Krkonoše without giving any details. Koltze (1873: 209, 210) published two localities: Brünnerberge and Koppenplan.

Letzner (1871: 12) records *L. montanus* from the subalpine, treeless ridges of Praděd and Králický Sněžník.

The record from the Olomouc area, published by Hudeček (1930: 372) is obviously a misidentification of *L. rufomarginatus* Dufschmid, 1812.

The occurrence of *L. montanus* in Babia Góra was published by Riehn (1914: 407), Makólski (1952: 215) (material from the collection Maczyński) and Pawlowski (1967: 497). Burakowski et al. (1973: 67–68) summarize the published historical records on the territory of Poland (Sudety Zachodnie: Karkonosze, Beskid Zachodni: Babia Góra, Tatry (Żółta Turnia, Śląsk, Sudety)). Razowski (1991: 8) confirms the occurrence of *L. montanus* in Poland, without giving any details.

The occurrence of *L. montanus* in Slovakia is mentioned by Pulpán & Hůrka (1993: 13) without presenting any records; however, Hůrka (1996: 50–51) records the species from Slovakia only tentatively.

The differentiation of the populations from Krkonoše and České středohoří Mts. is mentioned in the paper by Hůrka (1996: 48–51), in which Hůrka also offers reliable diagnostic characters of these two allopatric taxa.

Members of the taxon *L. montanus* have quite specific habitat requirements (petrophily, strict microclimatic conditions in habitats) and consequently their ability to migrate is limited. Based on this situation, it is possible to subdivide the populations of *L. montanus* into five subspecies, three of which are erected as new in this paper.

This is also supported by the findings of Veselý (1952: 420), who in his paper postulates probable evolution and distribution of the species of Hercynian origin, that before glaciation were able to spread over large areas. Subsequently, after the glacials, they proceeded to evolve in isolated groups of populations. Atlanto-hercynian origin of *L. montanus* is also postulated by Pulpán (1968: 122).

Bionomical and chorological data concerning *L. montanus* in Central Europe may be found e.g. in papers of Assmann (1993), Dvořák (1992), Horion (1941), Horvatovich (1971), Koch (1989), Landroth (1974), Marggi (1992) and Obenberger (1952).

The recent distributional ranges of the newly erected subspecies are shown on Fig. 6.

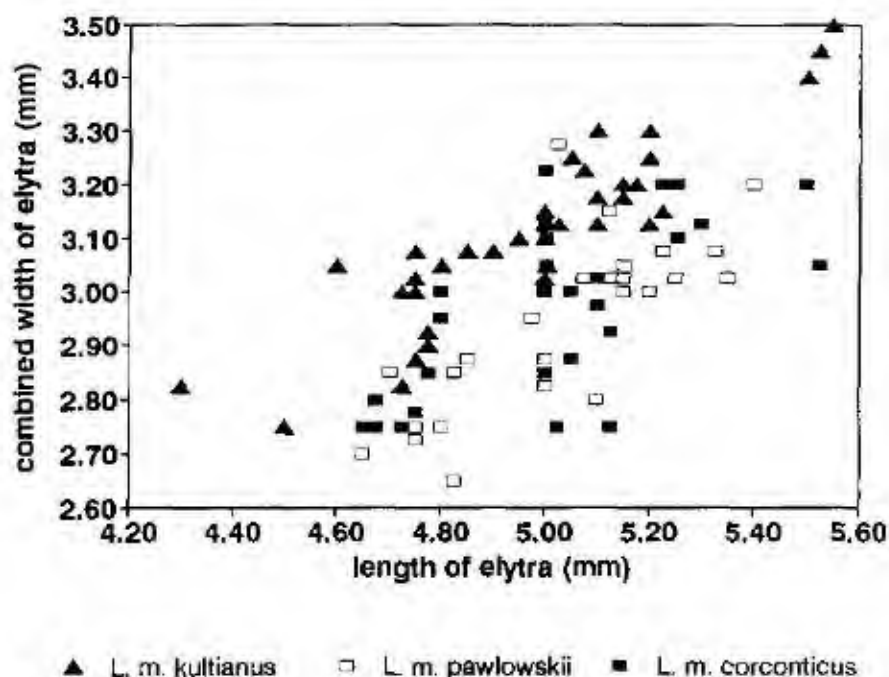


Fig. 5. Elytral index = length/combined width of elytra (lcl/w)

***Leistus (Pogonophorus) montanus montanus* Stephens, 1828**

*Leistus montanus* Stephens, 1828: 64

**MATERIAL EXAMINED:** 1 female, labelled "Power 96-69, ex collectio BMNH [British Museum of Natural History] London, det. & cum typo comparatum M. Fassati, 1977, cFSS, 5 males, labelled "Catacel" Arrau, 22 ix [19]23 ex collectio BMNH London, det. & cum typo comparatum M. Fassati, 1977, cFSS, cFAR, 1 female, same data, but 19 ix [19]22, Fergusson [leg.], cFSS

**DISTRIBUTION:** Locus typicus "Schottland" Great Britain, France, W Switzerland, N Spain (Jeanne 1973: 13, Margg: 1992: 58)

***Leistus (Pogonophorus) montanus rhaeticus* Heer, 1837**

*Leistus rhaeticus* Heer, 1837: 16

*Leistus montanus* var. *rhaeticus* Horion, 1941: 69, Csiki, 1946: 161

*Leistus montanus rhaeticus* Reitter, 1925: 333, Mrozek-Dahl, 1928: 36, Burmeister, 1939, Margg: 1992: 57

**MATERIAL EXAMINED:** 1 specimen, labelled "Steineter Jährl, 11 vii [19]40/Umg. Innsbruck Ti. Pechlaner/ *Leistus montanus* /Staatsslg. München/ Cum Typo comparatum [in ETH Zurich] M. Fassati, 1983/ *Leistus montanus rhaeticus* Heer, 1840, cZSM, 1 male, labelled "D. Rhod. Abthal, 15 v [19]51, J. Klapperich leg., cSMN, 1 female, labelled "Helvetia, Mattmark Wallis, 12 vii 1976, Sonderegger leg., cMGG, 1 specimen, labelled "Mt. Moro (VS), cNMB, 4 specimens, labelled "Biel (BE), cNMB, 1 male, labelled "Innsbruck, cFSS, 1 female, labelled "Nordtiro. Alpen, Brest [leg.], cFSS, 1 male, labelled "Innsbruck Umg., Brest [leg.], cFSS, 1 female, labelled "Graub. cFSS, 2 females, labelled "Bienne, 12 iv [19]16, A. Mathy [leg.], cFSS, 1 male, same data, but 22 iv [19]16, cFSS, 2 females, labelled "Brenner, cFSS, 1 male, same data, det. & cum typo comparatum M. Fassati, 1983, cFSS, 1 male, labelled "Schweiz, D. Kofze [leg.], cFSS, 1 male, 1 female, labelled "Helvetia, Jura, cFSS, 1 female, labelled "Jura, cFSS, 2 males, labelled "Schweiz, Bienne (Biel), cFAR, cFSS

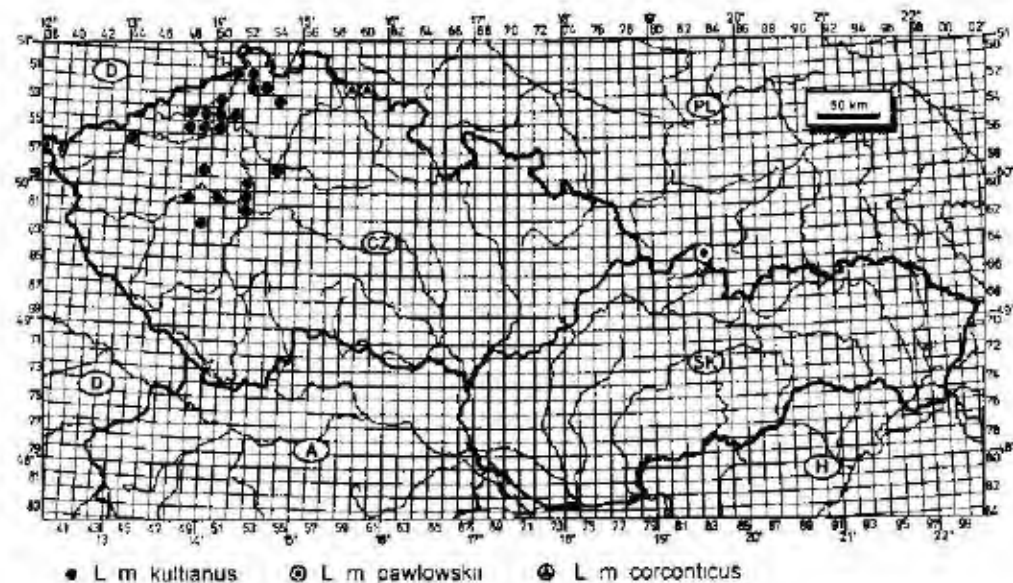


Fig. 6 Distribution of *Leistus (Pogonophorus) montanus kultianus* ssp. n. (dot), *L. (P.) m. pawlowski* ssp. n. (dot in circle) and *L. (P.) m. corconticus* ssp. n. (triangle in circle) in Central Europe



DISTRIBUTION. Locus typicus "Camogiscerthal" The Alps (France, Switzerland, Italy, Yugoslavia) (Maggi 1992: 58, Vigna Taglianti 1993: 7)

*Leistus (Pogonophorus) montanus corconticus* ssp. n.

(Figs 7, 10–11, 16–17)

DESCRIPTION (habitus of holotype and allotype as in Figs 16–17) Body length 7.7–9.1 mm (mean 8.48 mm), holotype 8.3 mm, allotype 9.0 mm, males 7.7–8.7 mm (mean 8.31 mm), females 8.1–9.1 mm (mean 8.63 mm). Blue to greenish-blue, rarely brownish-blue, shiny. Ventral surface piceous-black. Lateral bead of pronotum and elytra and epipleura brownish. Mandibles, maxillary appendages, antennae and entire legs brownish-yellow to yellow. Head with prominent eyes, area between eyes with very fine, evanescent punctation.  $IA = 1.20\text{--}1.38$  (mean 1.26).

Pronotum (Fig. 7) markedly cordiform (IPm/b =  $1.56\text{--}1.74$  (mean 1.66)), lateral bead evenly wide, flattened, lateral margin only slightly sinuate in front of posterior angles. Posterior pronotal angles obtusely angulate. Punctures on middle of pronotal disc small, fine. Anteromedial triangular depression and basal impression both with coarse and large punctures.  $IPw/l = 1.41\text{--}1.55$  (mean 1.47).

Elytra (Fig. 7) almost parallel-sided ( $IEl/w = 1.55\text{--}1.86$  (mean 1.68)), with humeral tooth. Punctuation of elytral striae finer, but distinct. Macropterous, wings  $1.14\text{--}1.23$  x as wide as elytral width. Scutellar setiferous punctures 1+1, dorsal setiferous punctures 1–5.  $IE/P = 1.18\text{--}1.37$  (mean 1.26).

Aedeagus (Figs 10–11) with apical portion obliquely truncate, actual apex prominent.

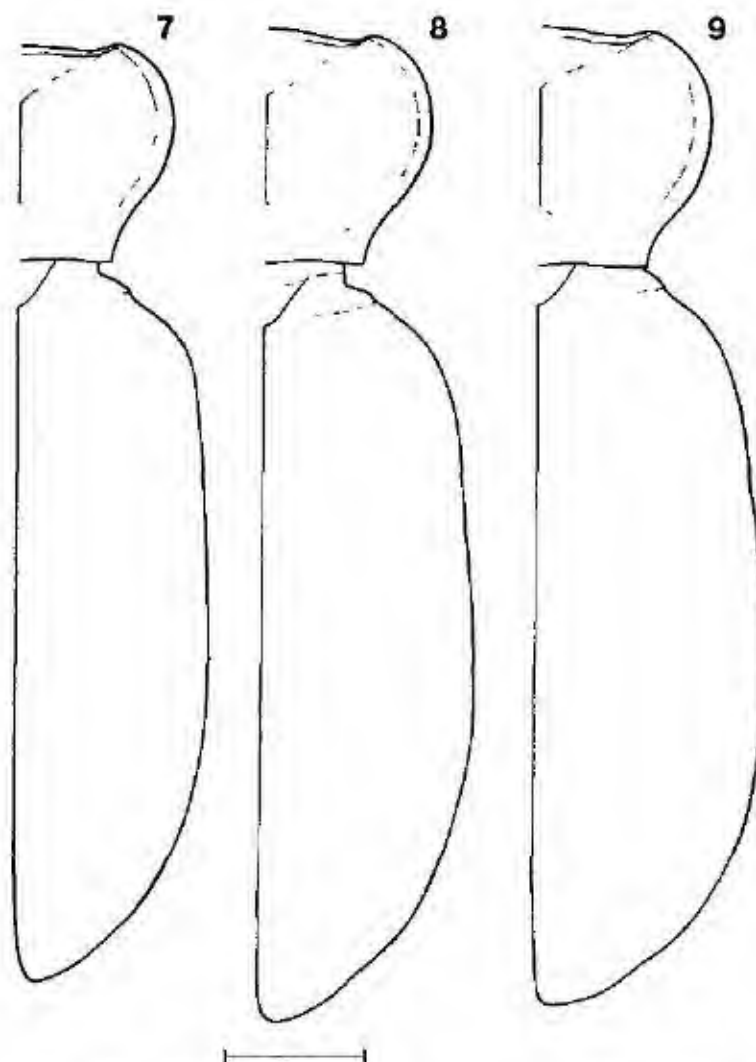
AFFINITIES. Differential diagnosis may be found in the key. The two new subspecies from the Czech Republic may be distinguished also by the characters given by Hárka (1996: 50–51). The differences in the shapes of the pronota, elytra and of the aedeagi of the two subspecies are shown by Figs 7–8, 10–13.

TYPE MATERIAL. **Holotype** Male, labelled Bohemia sept., Krkonoše [Mis], Vysoké kolo [MI], 1480 m, 11 ix 1945. M. Fassati lgt., cFSS. **Allotype** Female, same data as holotype, but 1485 m, cFSS. **Paratypes** One hundred-six specimens. Localities in the Czech Republic: 2 males, labelled Bohemia sept., Krkonoše, Vysoké kolo, 1480 m, 11 ix 1945, M. Fassati leg., cFSS, 1 male, same data, but 23 viii 1956, cFSS, 1 female, same data, but 1490 m, 11 v 1954, cFSS, 1 male, same data, but 1503 m, 27 viii 1957, cFSS, 1 male, 1 female, labelled Krkonoše, Vysoké kolo, cFSS, 1 male, labelled Bohemia or., Krkonoše, Vysoké kolo, 17 vii 1953, J. Pálán leg., cPUL, 1 male, same data, but vii 1962, Žitovnický leg., cPUL, 1 female, labelled Bohemia or., Krkonoše, Vysoké kolo, 17 vii 1957, Roška leg., cPUL, 1 specimen, labelled Riesengebirge [G. S. Juno] [19]67/ Collection v Seidlitz/ Staatsslg. München/ *Leistus montanus* ssp. *corconticus* det. M. Fassati 1985, cZSM, 13 males, 17 females, labelled Boh[emia] bor. or., [5259], Krkonoše, Vysoké kolo, 1470–1500 m, 13 ix 1987, R. Mlejnek lgt., cFAR, cFSS, cMLE, cPUL, cSKO, cWRA, 4 males and 1 female, labelled Bohemia or., Krkonoše, Vysoké kolo, 17 ix 1987, V. Zieris lgt., cFAR, cZIE, 1 male, 1 female, same data, but 22 ix 1987, cPMO, cPUL, 1 male, same data, but 22 ix [19]87, cPRO, 1 male, 1 female, same data, but 13 ix 1987, Z. Klouček lgt., cGEB, cPMO, 1 male, 1 female, labelled Boh[emia] b., [Krkonoše], Vysoké kolo, 1506 m, 17 vii 1957, [Z.] Lukovský lgt., cHON, 1 male, same data, but 15 vii 1963, 1503 m, cHON, 2 males, 1 female, labelled ČSSR Boh. or. [5259] Krkonoše, Vysoké kolo, 1470–1500 m, 6 ix 1987, R. Mlejnek lgt., cKAŠ, cLIN, 1 male, labelled ČSSR Bohemia b. or., Krkonoše, Vysoké kolo, 9 viii [19]87, J. Klouček lgt., cKAŠ, 2 females, labelled Bohemia bor.-or., Krkonoše, Vysoké kolo, 13 ix 1987, J. Klouček lgt., cKAŠ, cSCH, 1 female, labelled Boh[emia], Krkonoše, Vysoké kolo, 19 ix 1995, lgt. [T.] Kopecký, cZIE, 1 male, 1 female, labelled Krkonoše, Vysoké kolo, [J.] Mušan lgt., cNMP, 1 male, 2 females, labelled Bohemia bor. Krkonoše, Vysoké kolo, 10 v [19]52, O. Kavan leg., cFAR, 1 male, 1 female, labelled Krkonoše, Vysoké kolo, 11 viii [19]78, [J.] Prouza [lgt.], cBUL, cPRO, 2 females, same data, but 17 ix [19]87, cPRO, cTET, 1 male, 1 female, same data, but 20 viii [19]91, cFAR, cPRO, 8 males, 6 females, labelled Boh. bor. or., Vysoké kolo, 1470–1500 m, 22 viii–13 ix 1987, R. Mlejnek leg., cJMO, cSMF, 1 male, labelled Krkonoše, 6 ix 1987, leg. Mlejnek, cCHV, 1 male, 1 female, labelled Bohemia or., Krkonoše, Vysoké kolo, 13 ix 1987, Klouček leg., cMAR, cZUB, 1 female, labelled Bohemia, Krkonoše, Labská, 15 vii [19]52, Žitovnický lgt., cFAR, 1 male, labelled Boh[emia] b., Krkonoše, Studničná, vi 1957, V. Vasyka lgt., cZIE, 1 male, 1 female, labelled Boh[emia], Krkonoše, Sněžka, 1600 m, [K.] Hárka lgt., cHÚR, 1 female, labelled Krkonoše, 16 vii [19]62, Labská bouda, J. Doutnač [lgt.], cFAR, 1 male, 1 female, labelled Boh. b., Krkonoše, vii [19]62, Labská bouda, [J.]



Doutnáz [lgt], cGTT, 1 female, same data, but Vysoké kolo, cGTT, 2 females, labelled Boh[emia] bor Krkonoše Mts., Vysoké kolo, 1605 m, 15 vii 1995, J. Háva [gt], cHÁV, 1 male, 1 female, Riesengeb[irge], [without precise data], collectio V. Zoufal, Moravské museum Brno, cZMB, Localities in Poland 1 male, labelled Polska, Smrčné Jamy, 16 vii [19]62, J. Doutnáz [lgt], cFAR, 1 female, same data, but 17 vii [19]62, cFSS, 1 male, same data, but 19 vii [19]62, cFSS, 1 female, labelled Poland, Vysoké kolo, 29 vii 1980, P. Bulirsch leg., cBUL.

**ETYMOLOGY** The subspecific epithet is derived from the Latin name of the Krkonoše, the highest mountain range in Bohemia (and the Czech Republic), in which the new subspecies occurs.



Figs 7–9 Outlines of pronota and elytra of 7 – *Leistus (Pogonophorus) montanus corconticus* ssp. n., 8 – *L. (P.) m. kultianus* ssp. n., 9 – *L. (P.) m. pawlowaku* ssp. n. Scale 1 mm

DISTRIBUTION (Fig. 6). Bohemia: Krkonoše [Mt.] (Labská, Sněžka, Studničná, Vysoké kolo) [5259]; Polonia: Krkonoše [Mt.] (Sněžné jamy). Very rare and localized, in screes of the alpine zone. ACTIVITY. May (1/3), June (2/0), July (6/11), August (5/2), September (27/27).

*Leistus (Pogonophorus) montanus kultianus* sp. n.  
(Figs 8, 12–13, 18–19)

DESCRIPTION (habitus of holotype and allotype as in Figs 18–19). Body length 7.3–9.2 mm (mean 8.40 mm), holotype 8.5 mm, allotype 8.4 mm, males 7.5–8.6 mm (mean 8.19 mm), females 7.3–9.2 mm (mean 8.51 mm). Blue, greenish-blue, rarely purplish, shiny. Ventral side piceous-black. Lateral bead of pronotum and elytra and epipleura brownish, yellowish-brown, or brownish-red. Mandibles, maxillary appendages, antennae and entire legs brownish-yellow. Head with prominent eyes, area between eyes with distinct punctation.  $IA = 1.14\text{--}1.36$  (mean 1.22).

Pronotum (Fig. 8) cordiform, lateral bead evenly wide, flattened, lateral margin emarginate in front of posterior angles. Posterior angles acutely angulate to almost rectangular. Punctures on middle of pronotal disc small, coarser, more distinct. Anteromedial triangular depression and basal impression with large, coarse punctures.  $IPw/l = 1.43\text{--}1.60$  (mean 1.50),  $IPm/b = 1.51\text{--}1.75$  (mean 1.64).

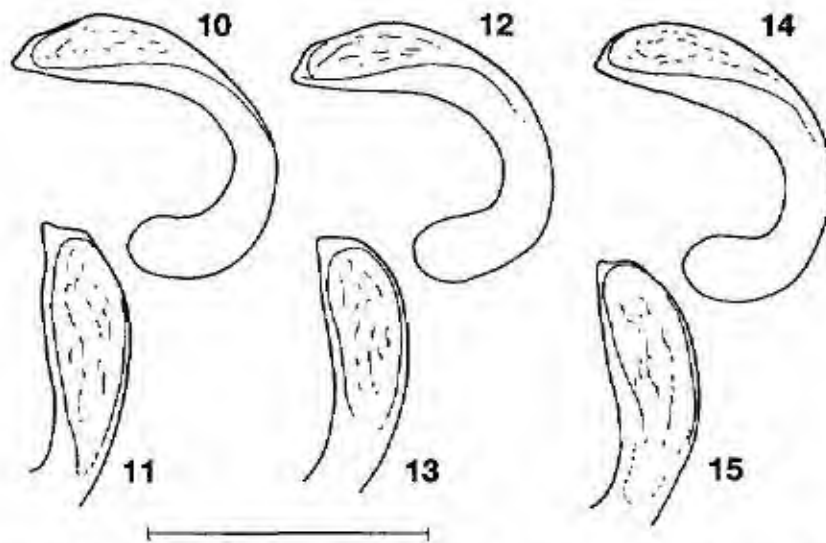
Elytra (Fig. 8) with lateral margins slightly convex, widest behind middle ( $IEl/w = 1.51\text{--}1.67$  (mean 1.60)), with humeral tooth. Punctuation of elytral striae coarser and distinctive. Macropterous, wings 1.25–1.36 as long as elytral width. Scutellar setiferous punctures 1+1, dorsal setiferous punctures 1–5.  $IE/P = 1.20\text{--}1.32$  (mean 1.26).

Aedeagus (Figs 12–13) with apex obliquely truncate.

AFFINITIES. Differential diagnosis may be found in the key. The two new subspecies from the Czech Republic may be distinguished also by the characters given by Hürka (1996: 50–51). The differences in the shapes of the pronota, elytra and of the aedeagi of the two subspecies are shown by Figs 7–8, 10–13.

TYPE MATERIAL. **Holotype**. Male, labelled: Bohemia sept., České Středohoří, Raná u Loun, 400 m, 18 iv 1965, north slope, deep in the scree, rainy weather, M. Fassati lgt., cFSS. **Allotype**. Female, same data as holotype, cFSS. **Paratypes**. Seven hundred-thirty nine specimens. Localities in Czech Republic: Blěšenský vrch 1 male, 1 female, labelled: Bohemia, České Středohoří, Blěšenský vrch, 14 ix 1993, P. Moravec leg., cPMO; Boreč 1 male, labelled: Bohemia, České středohoří, vrch Boreč, 24 iii 1957, leg. J. Strajček, cSTR; 2 males, same data, but 8.x.1959, cPUL, cSTR; 1 male, labelled: Bohemia sept., České středohoří, Boreč, iv.1958, M. Fassati leg., cFSS; 1 male, labelled: Bohemia, České středohoří, Boreč, ix.1967, J. Pulpán leg., cPUL; 1 female, labelled: Bohemia, České Středohoří, Boreč, 24 v.1973, [M.] Hončí lgt., cFAR; 2 males, labelled: CS –Bohemia b., České Středohoří, Boreč, t.v.1991, P. Bulirsch lgt., cBUL; 3 males, 2 females, same data, but M. Linhart lgt., cLIN; 1 male, 1 female, labelled: Bohemia bor., České středohoří, vrch Boreč, 22 v.1993, cJAR; 1 female, labelled: Bohemia, České středohoří, v. Boreč, 1 viii.1981, P. Moravec leg., cPMO; 1 male, same data, but 1.v.1991, P. Moravec leg., cPMO; 2 males, 1 female, same data, but 30 viii.1993, cPMO; 1 male, labelled: Bohemia, České středohoří, Boreč, 1 v.1991, I. Mareček leg., cMAR; 2 males, 2 females, same data, but 1.v.1995, cMAR; 1 male, 4 females, same data, but 29 viii.1996, cMAR; 4 females, same data, but 31.viii.1996, cMAR; 1 female, labelled: Bohemia b., [České] středohoří, v. Boreč, 4 ix 1993, M. Jaroš leg., cKLI; 5 males, 4 females, labelled: Bohemia bor., Boreč u Lovosic, 29 ix.1998, M. Kovarik lgt., cHAV, cKOV; Boreč 5 males, 7 females, labelled: Bohemia, České středohoří, Boreč, 31 v.1994, P. Moravec lgt., cPMO; 2 males, same data, but 27 ix 1994, cPMO; 3 males, 3 females, labelled: Bohemia bor., Boreč [5448], 16 ix 1995, J. Farkač leg., cFAR; Brdy 1 male, labelled: Bohemia, Brdy, Jordan, 30 ix –14 x.1995, leg. O. Hovorka, cHOV; Brná 2 males, 4 females, labelled: Bohemia sept., Brná n. Labem, 37 vi 1978, M. Antuš leg., cFAR, cDVO; 1 male, 1 female, labelled: Bohemia bor., České středohoří, Brná, Průčelská rokli, 3 ix.1993, cJAR; 4 males, 3 females, labelled: Bohemia, České Středohoří, Brná, v.1994, M. Hackel lgt., cFAR, cKAB; 1 female, labelled: Bohemia bor., Brná n. Labem, Průčelská rokli, 17 v.1994, P. Bulirsch lgt., cLIN; 8 males, 2 females, same data, but 24 ix 1995, M. Linhart lgt., cLIN; 10 males, 4 females, labelled: Bohemia, Brná, Průčelská rokli, 29.ix.1995, I. Mareček leg., cMAR; 5 males, 5 females, same

data, but 25.v.1996, cLIN. 7 males, 2 females, labelled: Bohemia, Brná n. Lab. env. 10.x.1998, J. Jurčíček lgt., cJUR, 1 male, 1 female, same data, but M. Kovarik lgt., cKOV, 21 males, 6 females, same data, but 17.x.1998, cJUR, 11 males, 5 females, same data, but M. Kovarik lgt., cHÁV, cKOV, cPLU, cROL. **Čertova jizba**, 5 males, 3 females, labelled: Bohemia, České středohoří, vrch Čertova jizba (5350), 8.x.1999, P. Moravec lgt., cPMO. **Česká Kamenice**, 1 female, labelled: České středohoří, Česká Kamenice, Zámecký výhled, 3.x.1995, P. Moravec lgt., cPMO, 1 female, labelled: Bohemia bor., Lužické hory mts., v. Studence nr. Česká Kamenice, 10.v.-21.vi.1998, J. Růžička leg., baited pitfall trap No 4 (fish meat, ripe cheese), scree on southern slope, bottom edge, cPMO. **Davle**, 1 female, labelled: [Bohemia], Davle, Březová, 4.vi.1971, Zeman lgt., cFSS. **Hazmburk**, 1 female, labelled: Bohemia bor., České Středohoří, Hazmburk, [?] 1946, Josef Král leg., cKRÁ. **Jilové**, 1 female, labelled: Bohemia cent., Jilové u Prahy, 7.ix.1952, O. Kavan leg., cFAR. **Kletečná**, 1 female, labelled: Bohemia bor., České Středohoří, Kletečná mts., 23.ix.1989, Jan Parkač leg., cFAR. **Klíč**, 19 males, 10 females, labelled: [Bohemia] Klíč u Nového Boru, 22.ix.1996, M. Honců lgt., cHON, cFAR, 1 female, labelled: ČSSR Bohemia b., Nový Bor, Klíč, 10.x.1982, [R.] Marschner lgt., cKAŠ; 1 male, labelled: Bohemia b., Klíč, 16.x.1983, [R.] Marschner leg., cCHV. **Lány**, 1 male, 2 females, labelled: CS-Bohemia c., Lány, iv.1984, K. Rébl lgt., cRÉB, cFAR. **Nehvizdy**, 1 male, 2 females, labelled: [Bohemia], Nehvizdy, 11.x.1958, [Z.] Lákešský lgt., cHON, cFAR; 1 female, same data, but 22.ix.1957, cHON; 1 female, labelled: ČSR, Nehvizdy, ix.19137, J. Král leg., det. K. Kult as *Leistus montanus rheticus* Heer, cFSS, 1 male, labelled: [Bohemia], Nehvizdy, 6.iv.1941, leg. K. Kult, det. Bänninger in 1943 as [*Leistus*] *montanus*, cFAR; 1 female, labelled: Bohemia cent., Nehvizdy, 11.ix.1952, O. Kavan leg., cFAR; 1 male, same data, but 27.ix.1956, B. Šticha lgt., cFAR, 1 male, 1 female, same data, but 7.x.1955, M. Dvořák lgt., cFAR, cGTT; 1 female, same data, but 22.ix.1946, Věš leg., cFAR; 1 male, 1 female, same data, but 1.x.1945, M. Passan leg., cFSS; 1 female, same data, but iv.1937, K. Kult leg., Dr. [J.] Mařan det. as *Leistus montanus rheticus* Heer, cFSS; 1 male, labelled: Bohemia, Nehvizdy, 13.x.1956, leg. Reška, cPUL, 1 male, same data, but 8.x.1958, cPUL; 1 male, 2 females, labelled: Bohemia c., Nehvizdy, 28.x.1961, leg. M. Dvořák, cDVO. **Oblík**, 2 males, labelled: Bohemia, Oblík u Loun, 23.iv.1977, D. Král lgt., cKRÁ; 1 male, 2 females, labelled: [Bohemia], Louny env., Oblík, 25.ix.1983, J. Parkač leg., cFAR, 1 female, labelled: Bohemia b., Ráná, vrch Oblík, v. [19]77, Rébl lgt., cRÉB; 1 male, 1 female, labelled: Bohemia bor., České středohoří, vrch Oblík, 25.x.1998, cJAR; 2 males, labelled: Bohemia, České středohoří, vrch Oblík (5348), 5.x.1999, P. Moravec lgt., cPMO. **Ověň**, 1 male, 1 female, labelled: Bohemia bor., České středohoří, vrch Ověň, 13.ix.1993, cJAR; 2 males, labelled: Bohemia, České Středohoří, v. Ověň, 13.ix.1993, P. Moravec lgt., cPMO. **Plešivec**, 4 males, 4 females, labelled: Bohemia, Plešivec, 2.ix.1971, M. Honců lgt., cHON, cFAR; 1 male, 1 female, labelled: Bohemia bor., České středohoří, vrch Plešivec, 1.x.1994, cJAR, 1 male, labelled: České středohoří, v. Plešivec prope Litoměřice, 1.ix.1993, P. Moravec lgt., cPMO, 2 males, same data, but



Figs 10–15. Aedeagi in dorsal and lateral view of holotypes of: 10, 11 – *Leistus (Pogonophorus) montanus* *corconticus* ssp. n.; 12, 13 – *L. (P.) m. kultianus* ssp. n.; 14, 15 – *L. (P.) m. pawlowski* ssp. n. Scale 1 mm.

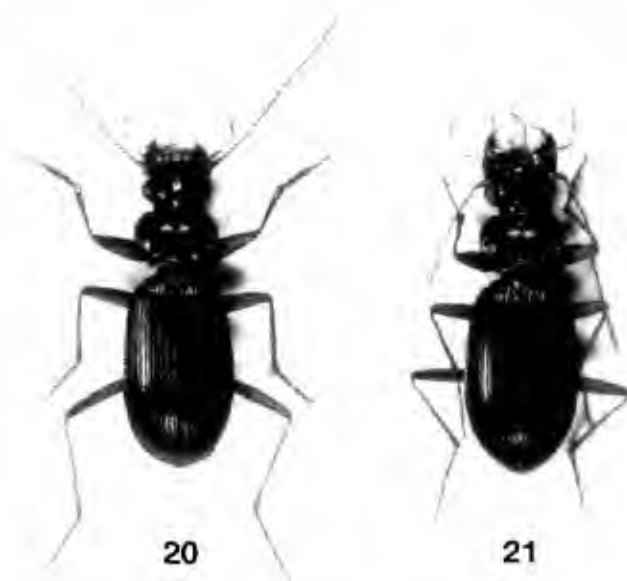
2 ix 1993 J. Růžička lgt., cPMO Praha-Hlubočepy: 1 male, labelled: Bohemia centr., Praha-Hlubočepy, 1 x 1939, J. Pulpán leg., cPUL Praha-Řeporyje: 1 male, labelled: Bohemia centr., Praha-Řeporyje, 16.iii.1991, 1. Mareček leg., det. as *Leistus montanus montanus* Stephens, 1827, det. 1. Mareček, 1995, cMAR Ralsko: 9 males, 11 females, labelled: Boh[emia] Ralsko, 6 x.1996, [M.] Honců lgt., cHON, cFAR, 1 female, labelled: Bohemia, Ralsko, 3 vi.1985, cFAR, 1 male, labelled: Bohemia, Ralsko, 15.vi.1985, leg. J. Chvalivský, cCHV, 1 male, same data, but 27 v.1986, cCHV, 11 males, 21 females, same data, but 3 vi.1997, cCHV, cFAR: 16 males, 19 females, labelled: Bohemia bor., vrch Ralsko [5354], 15 vi.1994, P. Kučera lgt., cKUC, cVON: 1 female, same data, but 11 ix.1984, R. Beran lgt., cBER, 2 females, same data, but 28 v.1994, cBER. Raná: 3 males, 2 females, labelled: Bohemia, České středohoří, Raná, 25.iv.1964, Reška leg., cPUL: 5 males, 5 females, labelled: Bohemia sept., České středohoří, Raná u Loun, 400 m, 18.iv.1965, M. Fassati leg., cFSS, cNMP: 1 male, same data, but *Leistus montanus kultanus* m. det. M. Fassati, 1985, cZSM, 6 males, 3 females, labelled: Bohemia, České středohoří, Raná, 18.iv.1965, J. Pulpán leg., cPUL, 1 female, same data, but iv.1966, cPUL: 2 males, 1 female, same data, but 12.x.1966, cZMB, 24 males, 14 females, same data, cPUL: 1 male, 1 female, same data, but v.1967, cPUL, 2 males, 1 female, Bohemia sept., České Středohoří, Raná, 23.iv.1967, M. Fassati leg., cFSS: 1 male, 1 female, same data, but 27.iv.1968, cHEI: 1 male, 1 female, labelled: Boh[emia], Louny env., Raná, 25.ix.1983, J. Farkaš leg., cFAR, cČER: 1 male, same data, but 12 ix.1995, cFAR, 1 male, same data, but 9 ix.1997, cFAR, 2 males, 1 female, labelled: Boh[emia] bor., Raná, [České] Středohoří, 1 xi.1972, M. Honců lgt., cHON: 1 male, 1 female, same data, but 20 x.1971, cHON: 1 male, same data, but 22 ix.1971, cHON, 1 male, labelled: Bohemia, vrch Rana, 30 iv.1972, leg. J. Strejček, cSTR, 1 male, labelled: Bohemia, Raná nr. Louny, x.1969, leg. V. Skoupý, cSKO: 1 male, same data, but 15 v.1982, cSKO: 1 male, labelled: Bohemia, Raná, 16 v.1982, leg. [V.] Skoupý, cMHG, 2 males, 8 females, same data, but 25 ix.1981, leg. Trávníček, cHEI, cSKO, 1 female, same data, but 20 vi.1981, cPUL, 2 males, 3 females, labelled: Bohemia, Raná u Loun, 23 iv.1977, D. Král lgt., cKRÁ, 1 male, labelled: Bohemia, České středohoří, Louny – Raná, 28.ix.1980, [T.] Scholz leg., cPUL: 6 males, 6 females, same data, cSLZ, 1 male, 2 females, same data but 23 x.1977, cSLZ, 3 females, labelled: CS-Bohemia occ., Raná, 16 v.1982, [K.] Rěbl lgt., cHÁV, cKAŠ, cWRA: 1 specimen, labelled: Bohemia, Louny – Raná, P. Krásenský lgt., cLAK, 1 male, same data, but 24.x.1993, cFAR: 2 specimens, labelled: Bohemia, Raná, 25 ix.1981, Z. Trávníček lgt., cLAK: 1 male, 1 female, same data, but cZVA: 1 male, labelled: Bohemia, České středohoří – vrch Raná, 9 v.1984, P. Veselý leg., cVES: 1 male, same data, but 27.ix.1990, cVES [a copulating pair on a rock in the scrub on a sunny morning, the female escaped]; 2 males, 3 females, same data, but 13 vi.1995, cVES [in scrub after rain]; 7 males, 5 females, same data, but 13–14 vi.1995, cVES [resting during the night, 23.00–0.30 am, on rocks in scrub after rain, temperature 9°C, 100% relative humidity (Veselý & Těšal, 1998)]; 1 male, 1 female, labelled: Boh[emia] bor., Raná, 25 v.1985 Šilha lgt., cMGG, cWRA, 1 female, labelled: Bohemia, Raná, 14 iv.1984, Petr Ričí leg., cJAN, 2 males, 1 female, labelled: Boh[emia], České Střed., Raná, 25 ix.1985, [P.] Bulirsch leg., cBUL, 2 males, same data, but 24 iv.1983, cWRA: 2 males, 1 female, labelled: CS-Bohemia occ., Raná, vrch Raná, 16 v.1982, [K.] Rěbl lgt., cRĚB, 1 male, same data, but v.1984, cPRO, 1 female, labelled: Boh[emia] bor., Raná, 26 v.1982, R. Wachtl lgt., cPRO, 1 female, same data, but iv.1983, cJAN: 1 female, same data, but v.1984, cJAN: 5 males, 6 females, labelled: Boh[emia] centr., Raná – ssutě, 4 v.1963, [K.] Hůrka lgt., cHŮR: 1 female, same data, but Rana severovýchod, 29 v.1962, cHŮR: 3 males, 2 females, labelled: Bohemia b. oc., Lonošice – Raná, 20.ix.1986, [J.] Prouza leg., cPRO, cPUL: 2 males, 1 female, labelled: Bohemia b., Raná, 28.viii.1994, leg. Moravec, cCHV: 1 male, 1 female, labelled: Bohemia b. Raná, 6.iv.1995, leg. [P.] Krásenský, cCHV: 1 male, 1 female, labelled: Bohemia bor., České středohoří, vrch Raná, 28.x.1992, cJAR: 6 males, 4 females, labelled: Bohemia, České středohoří, Raná, 2 ix.1993, O. Hovorka leg., cHOV: 1 female, labelled: Bohemia b., Raná, 25 ix.1985, Z. Trávníček leg., cMKA, 2 females, labelled: Bohemia, České středohoří, v. Raná, 15.vi.1975 J. Hejkal leg., cHEI, cPMO: 1 female, same data, but 6–15 vi.1975, cZVA: 2 males, 4 females, same data, but 28.x.1992, P. Moravec leg., cPMO: 2 males, same data, but 4 ix.1993, cPMO, 1 female, same data, but 14 ix.1993, cPMO, 1 male, labelled: Bohemia bor., Raná u Loun, 28 x.1990, M. Linhart lgt., cLIN: 1 female, labelled: Bohemia, České středohoří, vrch Raná, 22 iii.1999, P. Moravec & J. Růžička leg., cNBA: 1 female, labelled: Bohemia, České středohoří, Raná u Loun, 25 v.1984, Šilha leg., cMAR: 1 male, 1 female, same data, but 21 x.1989, leg. 1. Mareček, cMAR, 9 males, 1 female, labelled: Bohemia bor., Raná p. Louny, 17 ix.1983, leg. M. Rejzek, cREJ: 1 male, labelled: Bohemia, Raná u Loun, 14 x.1989, Hoskovec lgt., cJUR: 1 male, same data, but 22 ix.1990, cJUR: 1 female, labelled: Bohemia b., Raná, 28 x.1992, M. Jaroš leg., cKL: 1 male, 4 females, labelled: Bohemia b., Raná, 10 iv.1993, O. Odvárka leg., cGEB, cKLI, 1 male, 1 female, labelled: Bohemia, Raná u Loun, 12 ix.1993, J. Jurčíček lgt., cJUR: 1 male, labelled: Boh[emia], Raná, Louny env., 7 xi.1993, cGEB: 3 males, 4 females, labelled: Bohemia, Raná u Loun, 20 ix.1994, J. Schneider lgt., cČRV, cJAN, cSCH: 1 female, labelled: Bohemia, Raná u Loun, 28.viii.1994, Kučera lgt., cJUR Sedlo: 1 male, labelled: Bohemia bor., České Středohoří, vrch Sedlo pr. Liběšice, 620 m, 9 ix.1994, P. Moravec lgt., cPMO, 2 females, same data, but 23 v.1995, P. Moravec leg., cPMO, cFAR Srbsko: 2 females, labelled: Boh[emia], [Český kras], Srbsko, 12.iii.1967, V. Malý lgt., cGTT, cMAL: 1 male, same data, but 15 x.1967, cHŮR: 2 females, same data, but 24.iii.1968, cFAR, cTĚT. Srdec: 4 males, 3



Figs 16-19. Habitus of holotypes (16, 18) and allotypes (17, 19) of: 16, 17 - *Leisus (Paganopharus) momianus carinatus* ssp. n., 18, 19 - *L. (P.) m. kulianus* ssp. n. Scale 1 mm.

females, labelled: Bohemia bor., České středohoří, Srdov, 12.x.1966, J. Pulpán leg., cPUL; 1 male, 1 female, labelled: Bohemia bor., České středohoří, vrch Srdov, 4.ix.1993, P. Moravec leg., cPMO; 2 males, 2 females, labelled: Bohemia, České Středohoří, v. Srdov, 4.ix.1993, P. Moravec leg., cPMO; 1 male, 5 females, labelled: Bohemia sept., České středohoří, Srdlov [= Srdov?], N of Louny, 18.iv.1965, 440 m, M. Fassati leg., cHEI, cFRE, cFSS; 1 male, same data, but 20.iv.1973, cFSS. Stráž nad Ohří: 2 males, 1 female, labelled: Bohemia oc. [5644]. Stráž n.O., Hrnčístín, 3.xi.1992, 400–480 m, J. Hejkal lgt., cHEJ, cFAR; 2 males, 1 female, labelled: Bohemia, Doupovské hory, Stráž nad Ohří, Ivo Těřál lgt., cTĚT. Svor: 4 males, 2 females, labelled: ČSSR Bohemia b., Svor, 16.x.[19]83, [R.] Märschner lgt., cKAŠ, cBUL; 2 females, labelled: Boh[emia] Svor, 16.x.1983, cKAŠ; 1 specimen, labelled: Bohemia, Svor, 24.v.1954, Říha lgt., cLAK; 1 specimen, same data, but 17.x.1980, cLAK. Týřov: 1 male, labelled: Bohemia centr., Křivoklatsko [4860], Týřovické skály, 73. km tok Berounky, 1.iv.1994, J. Růžicka leg., cFAR. Ústí nad Labem: 1 female, labelled: Bohemia b., Ústí nad Labem env., Průčelská rokle, 30.v.1994, P. Bulirsch lgt., cFAR; 3 males, 7 females, same data, but 28.v.1994, cBUL; cFAR, 2 males, 1 female, the same data, but 17.vi.1994, cPRO; 1 male, same data, but 6.v.1994, cKME; 2 males, same data, but v.1994, cJAN; 4 males, 2 females, labelled: Bohemia, Průčelská rokle, vrch malý Ostrý, 3.ix.1993, P. Moravec leg., cPMO; 4 males, 3 females, same data, but 11.v.1995, cPMO; 1 male, labelled: Bohemia bor., České středohoří, Průčelská rokle, 24.ix.1995, M. Jaroš lgt., cVON. Vršetín: 1 female, labelled: Boh. centr., Vršetín-východ, 5.v.[19]63, [K.] Hůrka lgt., cHÜR. Zlatník: 2 males, 1 female, labelled: Bohemia bor., České středohoří, Zlatník, 31.v.1994, P. Moravec lgt., cPMO; 18 males, 6 females, same data, but 27.ix.1994, cPMO, cFAR, cKLI, cSME. Želenický vrch: 9 males, 7 females, labelled: Bohemia, České středohoří, Želenice, 12.x.1966, J. Pulpán leg., cPUL; 1 male, 2 females, labelled: Bohemia, České středohoří, Želenický v., 19.iv.1994, P. Moravec lgt., cPMO; 1 male, 2 females, same data, but 31.v.1994, cPMO; 1 male, same data, but 27.ix.1994, cPMO; 1 male, same data, but 5.iv.1995, cPMO. Localities in Germany: 1 male, labelled: Sächsisch[e] Schw[e]iz, Rauenstein, Höhle am Pudelstein, 7.i.1972, Barbertal: Formalin 30/0, *L. spinibarbis montanus* Steph., det. Dr. Horvatovich, cSMD.

**ETYMOLOGY.** Patronymic, the new subspecies was named in memory of the renowned Czech carabidologist, Prof. Karel Kult from Praha.



Figs 20, 21. Habitus of holotype (20) and allotype (21) of *Leistus (Pogonophorus) montanus pawlowski* ssp. n. Scale 1 mm.



**DISTRIBUTION** (Fig. 6) Czech Republic (Bohemia) Blešenský vrch [5549], Boreč [5449], Bořen [5448], Brdy (Jordán) [6249], Čertova jizba [5350], Česká Kamenice (Zámecký vrch) [5252], Česká Kamenice (vrch Studenec) [5152], Davle [6052-6152], Jilove u Prahy [6152], Hazmburk [5550], Kletečná [5449], Klíč u Nového Boru [5253], Láň [5849], Nehvizdy [5854], Obřih [5548], Ovčín [5449-5450], Plešivec [5450], Praha (Hlubočepy, Řeporyje) [5952], Ralsko [5354], Rana [5548], Sedlo u Liběšic [5451], Srbsko [6050], Srdov [5548], Stráž nad Ohří (Himlštejn) [5644], Svor [5253], Ústí nad Labem (Brna, Průchelská rokle, vrch Malý Ostrý) [5350], Týřov [6048], Vršetín [5549], Zlatník [5448], Želenický vrch [5448]. Germany (Saxonian Switzerland) Schmilka, Rauenstein  
**ACTIVITY** January (1/0), March (2/5), April (35/34), May (54/54), June (30/37), July (11/22), August (5/12), September (133/83), October (121/77), November (5/2) Very rare and very localized in screes and dry, not shaded habitats in hills and in lowlands

***Leistus (Pogonophorus) montanus pawlowskii* ssp. n.**  
 (Figs 9, 14–15, 20–21)

**DESCRIPTION** (habitus of holotype and allotype as in Figs 20–21) Body length 7.6–9.1 mm (mean 8.50 mm), holotype 8.5 mm, allotype 9.0 mm, males 7.6–8.6 mm (mean 8.26 mm), females 8.1–9.1 mm (mean 8.73 mm) Blue to greenish-blue, rarely with purplish hue, shiny Underside piceous-black Lateral bead of pronotum and elytra and epipleura brownish Mandibles, maxillary appendages, antennae and entire legs brownish-red to brownish-yellow Head with prominent eyes, area between eyes finely punctate  $IA = 1.20\text{--}1.34$  (mean 1.27)

Pronotum (Fig. 9) markedly cordiform ( $IPm/b = 1.52\text{--}1.70$  (mean 1.64)), lateral bead evenly wide, flattened, lateral margin only slightly emarginate in front of posterior angles Posterior angles obtusely angulate to almost rectangular Punctures on middle of pronotal disc small, coarser Anteromedial depression and basal impression with large, coarse punctures  $IPw/l = 1.41\text{--}1.56$  (mean 1.46)

Elytra (Fig. 9) almost parallel-sided ( $IEL/w = 1.53\text{--}1.82$  (mean 1.70)), with humeral tooth Punctuation of elytral striae finer, but distinctive Macropterous, wings 1.28–1.37 as long as elytral width Scutellar setiferous punctures 1+1, dorsal setiferous punctures 1–5  $IE/P = 1.18\text{--}1.32$  (mean 1.24)

Aedeagus (Figs 14–15) with apical portion obliquely truncate, apex prominent

**AFFINITIES** Differential diagnosis may be found in the key The differences in the shapes of the pronota, elytra and aedeagi of the new subspecies are shown in Figs 7–15

**TYPE MATERIAL** **Holotype** Male, labelled [Poland], Babia góra, M. Rybicki [leg.] /coll. M. Fassati, 1946, ex coll. Makólski, Varšava, cFSS **Allotype** Female, labelled Slovakia, Babia góra, 23 vi 1996, [A.] Vrzcenonko leg., cFAR First record of *L. montanus* for Slovakia **Paratypes** Thirty-five specimens **Localities in Poland** 2 males, 2 females, labelled Polonia m., distr. Myslenice, Babia Góra, 30 vi–1 vii 1898, leg. Stobiecki, ex coll. Stobiecki Inst. Zool. P.A.N. Krakow, 32/57, cFAR, cFSS, cSTO, cHÜR, 9 males, 6 females same data, but 24 vi 1905, cBUL, cFAR, cFSS, cLIN, cMAR, cPMO, cSTO, cVES, cWRA, cHÜR, 1 male, same data, but 12 vii 1896, cFSS, 1 male, 1 female, labelled Galicia Babia góra, 28 vi 1912, F. Bluhweiss leg., ex coll. A. Winkler, Wien, 1944, cFSS 1 male, labelled Babia góra, 30 vi [?], coll. M. Fassati, 1946, ex coll. Makólski Varš., cFSS, 1 female, labelled Babia Góra, 8 vii 1948, Biulowski leg., cPUL, 2 females, labelled Polonia m., Babiagorski P.N., 25 v 1961, J. Pawlowski leg., det. J. Pawlowski as *L. montanus* Steph., cFSS, 1 female, labelled Babia Góra, 17/174, ex coll. M. Rybicki Inst. Zool. P.A.N., Krakow, 34/57, cFSS, 1 male, 3 females labelled Polonia mer., [6483] Beskid Zywiecki, Babia góra mt., 20–23 vi [19]98 [J.] Stanovsky lgt., cFAR, cSTA, 1 male, labelled Polska, 19 vi 1998 Babia Góra, lgt. Orszulik, cLOH, 1 male, labelled Polska, Babia góra, 26 vi 1998, Kolomény leg., cKME 1 male Babia Góra, [without precise data], collectio V. Zoufal, Moravské museum Brno cZMB, **Locality in Slovakia** 1 female, labelled Slovakia, Babia góra, 23 vi 1996, [A.] Vrzcenonko leg., cKL (first record (with allotype) of *L. montanus* for Slovakia)

**ETYMOLOGY** Patronymic, the subspecies was named in honour of the renowned carabidologist, Dr Jerzy Pawlowski (Poland)



DISTRIBUTION (Fig. 6). Poland: Babia Góra; Slovakia: Babia Góra [6483].

ACTIVITY. May (0/2), June (15/13), July (2/1), August (0/1). Very rare; in screes.

#### Key to the subspecies of *Leistus montanus* Stephens, 1827

- 1 small subspecies (6.8–8.1 mm), posterior angles of pronotum sharp, elytral striae coarsely punctate, finer at apex, elytral apex elongate-acute ..... *L. m. montanus* Stephens, 1827  
Distribution: Great Britain, France, W Switzerland, N Spain
- larger subspecies (7.6–9.2 mm), posterior angles of pronotum more obtuse, elytral striae more finely punctate, elytral apex ± rounded ..... 2
- 2 lateral margins of elytra ± parallel; elytra with blue to green hue, rarely with purplish hue. .... 3
- lateral margins of elytra rounded; elytra with pronounced, metallic blue hue, sometimes with purplish hue. .... 4
- 3 pronotum more transverse, punctuation of pronotal disc coarser, aedeagus as in Figs 14–15 ..... *L. m. pawlowskii* ssp. n.  
Distribution: Babia Góra Mts (Polish-Slovak boundary)
- pronotum less transverse, punctuation of pronotal disc finer, aedeagus as in Figs 10–11. .... *L. m. corconticus* ssp. n.  
Distribution: Krkonoše Mts (Polish-Bohemian boundary)
- 4 slenderer subspecies (LEI/w 1.68–1.77), punctuation of both elytral striae and pronotal disc finer ..... *L. m. rhaeticus* Heer, 1837  
Distribution: the Alps (France, Switzerland, Italy, Slovenia)
- stouter subspecies (LEI/w 1.51–1.67), punctuation of both elytral striae and pronotal disc coarser ..... *L. m. kultianus* ssp. n.  
Distribution: Czech Republic (Bohemia), Germany (Saxonian Switzerland)

#### CONCLUSIONS

The taxonomy of the subgenus *Pogonophorus* of the genus *Leistus* is quite difficult, particularly the identification of the European species related to *Leistus montanus*. It may be postulated that the original, preglacial distributional range of this Hercynian species included considerable portion of Europe, particularly of western Europe, and that during the postglacial period the species was evolving in groups of isolated populations. A meaningful clarification of the relationships of the taxa of this complex may be attempted only after a detailed study of large numbers of specimens from different localities not only on the Balkan Peninsula, in Turkey, Syria, and on the Iberian Peninsula, but also from the mountain ranges in Italy, southern Germany, Switzerland and France. Unfortunately, we were not able to include the material from the general collection of the Muséum d'histoire naturelle, Paris (two boxes containing specimens of the *Leistus montanus*-group were not available for extended study). Also, we were not able to assess the specimens from the xerothermic slopes at Wilhelmsfeld near Heidelberg (Heinz 1964), as well as from Baden-Württemberg (Trautner & Müller-Motzfeld 1995). However, after we have studied the available, very large relevant material, we believe that the complex of *Leistus montanus* includes the following species and subspecies distributed as follows:

- L. montanus montanus* Stephens, 1827: Great Britain, France, W Switzerland, N Spain
- L. montanus rhaeticus* Heer, 1837: France, Switzerland, Austria, N Italy, Slovenia
- L. montanus corconticus* ssp. n.: Czech Republic (NE Bohemia), SW Poland
- L. montanus kultianus* ssp. n.: Czech Republic (Bohemia), Germany (Saxonian Switzerland)
- L. montanus pawlowskii* ssp. n.: S Poland, N Slovakia
- L. puncticeps* Fairmaire et Laboulbène, 1854: France
- L. parvicollis* Chaudoir, 1869: Bulgaria, Greece, Turkey, Syria

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**Larvae of Pogonini (Coleoptera: Carabidae):  
genera *Pogonus*, *Pogonistes*, *Cardiaderus*, and *Thalassotrechus***

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**Abstract.** Larvae of the genera *Pogonus* Dejean, 1821, *Pogonistes* Chaudoir, 1871, *Cardiaderus* Dejean, 1828, and *Thalassotrechus* Van Dyke, 1918 of the tribe Pogonini are described. A key to the four genera and illustrations of the most important features are provided. Characters of larvae suggest that the tribe Pogonini represents a monophyletic lineage based on three synapomorphies: 1) presence of spindle-shaped setae on some parts of the body, 2) position of the seta FR<sub>1</sub> on frontale near FR<sub>2</sub>; 3) absence of a relatively long secondary seta on each lateral margin of the ninth abdominal tergite (just anterior to UR<sub>2</sub>) in second and third instars. This study supports inclusion of Pogonini in the supertribe Trechitae together with Bembidiini, Trechini and Zolini. Both *Cardiaderus* and *Thalassotrechus* are very distinct and their relationships uncertain. Monophyly of *Pogonus* and *Pogonistes* is not evident, presumably these taxa are more related to each other than to the other two genera treated.

**Morphology, phylogeny, description, key, larvae, Coleoptera, Carabidae, Pogonini, *Pogonus*, *Pogonistes*, *Cardiaderus*, *Thalassotrechus***

INTRODUCTION

The tribe Pogonini is represented in all major zoogeographical regions of the world but is most diverse in the Palearctic, particularly in the Mediterranean area. This group includes about 70 species, which are classified in the genera *Bedeliolus* Semenov, 1900, *Cardiaderus* Dejean, 1828, *Diodercarus* Lutshnik, 1931, *Diplochaetus* Chaudoir, 1871, *Ochtozetus* Chaudoir, 1871, *Pogonistes* Chaudoir, 1871, *Pogonopsis* Bedel, 1898, *Pogonus* Dejean, 1821, *Syrdenus* Chaudoir, 1871, and *Thalassotrechus* Van Dyke, 1918 (Bousquet & Laplante 1997). In addition, Komarov (1996) recently described, as a pogonine, a genus with uncertain affinities (*Olegius*) based on a single female collected in southwestern Turkmenia. The tribe Pogonini is currently placed in the supertribe Trechitae along with Trechini, Zolini (Menzodini of some authors) and Bembidiini (including Tachyna) (Kryzhanovskij 1976, 1983; Erwin 1985, 1991). All species, except apparently those of *Ochtozetus* from South America (see Reichardt 1974), live in saline habitats and are found in littoral places or around inland salt lakes, ponds or pans.

Very little is known about Pogonini larvae. Morphological descriptions of older-instar larvae of only four species included in two genera have been published: *Pogonus cumanus* (Sharova 1958, 1964), *P. luridipennis* (Jeannel 1941; van Ermden 1942; Sharova 1958, 1964; Larsson 1968; Raynaud 1976; Luff 1985, 1993; Arndt 1991), *P. chalcone* (Luff 1985, 1993; Arndt 1991), and *Thalassotrechus barbarae* (Moore 1956; Thompson 1979).



The main purpose of the present paper is to describe the larval features of four genera of the tribe Pogonini. In addition, relationships between these genera based on larval morphology will be briefly discussed.

## MATERIALS AND METHODS

This work is based on the study of 46 slide-mounted larvae of Pogonini belonging to 11 species and four genera, 62 additional larvae were available in alcohol but not studied in detail. All larvae, except one specimen, were reared *ex ovo* from mature females kept in laboratory. Adults were collected during expeditions by the senior author along saline lakes in southern Ukraine (Dnestrovsky and Kuyalinsky Limans in the Odessa district), southern Russia (Sarepta in Volgograd area and Baskunchak Lake in the Astrakhan district), and southwestern Turkmenia (Uzboy Lakes system, southwestern part of the Kara Kum). Larvae of *Thalassotrechus barbatae* were borrowed from the Canadian National Collection of Insects, Ottawa, Canada (CNC). Most larvae are kept in the collection of the senior author (VVG), the remaining have been deposited in CNC, the British Museum of Natural History, London (BMNH), and Martin L. Luff collection, University of Newcastle upon Tyne (MLL).

Larvae were mounted on microscope slides in Hoyer's medium and studied with a compound microscope MBI-1 at magnifications up to 900 $\times$ . Morphological drawings were prepared using a Rouchert camera lucida. Notation of primary sensilla follows Bousquet & Goulet (1984), notation of secondary setae follows Bousquet (1985).

All measurements were made using an ocular micrometer. Measurements of antennomeres were taken along their medial side, including the membranous part. The abbreviations  $L_1$ ,  $L_2$ ,  $L_3$  indicate first, second, and third instars respectively.

For comparative purpose, larvae of 22 genera belonging to the supertribe Trechitae have been studied: *Aepopsis* Jeannel, 1922, *Temnostega* Enderlein, 1905, *Perileptus* Schaum, 1860, *Thalassophilus* Wollaston, 1854, *Amblystogentium* Enderlein, 1905, *Trechus* Clairville, 1806, *Epaphus* Samouelle, 1827, and *Trechimorphus* Jeannel, 1927 of the tribe Trechini; *Bembidion* Latreille, 1802, *Asaphidion* Des Goez, 1886, *Ocys* Stephens, 1828, *Phryganeus* Casey, 1924, *Tachys* Dejean, 1821, *Paratachys* Casey, 1918, *Sphaerotachys* G. Muller, 1926, *Elaphropus* Motschulsky, 1839, *Porotachys* Notolitzky, 1914, *Tachyta* Kirby, 1837, *Polyderus* Motschulsky, 1862, and *Myopachys* Bates, 1882 of the tribe Bembidini; *Oopterus* Guérin-Mèneville, 1841 and *Idacarus* Lea, 1910 of the tribe Zolini.

No descriptions of species are provided in this paper in part because the number of available larvae was low. A preliminary analysis indicates that differences among most pogonine species are slight, especially in the second and third instars.

## Tribe Pogonini

**DIAGNOSIS.** Larvae of Pogonini differ from those of other groups included in the supertribe Trechitae by the presence of spindle-shaped setae (see Fig. 17) on some sclerites. In the first instar, at least setae  $ES_1$  on pro- and mesothorax,  $EP_1$  on ninth abdominal segment, and  $PY_2$  on pygidium are spindle-shaped. In the second and third instars, there are numerous short, secondary, spindle-shaped setae on the dorsal surface of the cephalic capsule. Such modified setae are absent in larvae of other Trechitae examined. In addition to this character, we should mention (1) that the frontal sutures are less sinuate in larvae of Pogonini compared to those of other Trechitae groups, (2) that seta  $FR_2$  on the frontale is closer to  $FR_1$  than on average for Trechitae, and (3) that each lateral margin of the ninth abdominal tergite in second and third instars lacks a secondary seta (just anterior to  $UR_2$ ) present in most Trechitae larvae known to us.

**DESCRIPTION.** Head widths of specimens studied are indicated in Table 1. **First-instar larvae.** Moderately sclerotized; coloration varying from very light, almost colorless, to somewhat brown or grey. Cephalic capsule without basal constriction; parietale with 2 rows of 3 ocelli in most species, ocelli of posterior row small to absent in some species; postocellar and cervical grooves present or not. Frontal sutures only slightly sinuate (Figs 2–9); epicranial suture relatively long, 0.7–1.0 $\times$  as long as antennomere 1 (Figs 2–9); nasale variable (Figs. 10–14), somewhat produced and denticulate, with a single row of denticles (Figs 10–14). Egg-bursters absent (Figs 2–5, 7–9) except in *Thalassotre-*

Tab. 1 Cephalic capsule width (mm) of pogonine larvae studied

Species	L1			L2		L3	
	n	M	Range	n	M	n	M
<i>Pogonius luridipennis</i>	2	0.56	0.55–0.56	1	0.75	1	1.35
<i>Pogonius iridipennis</i>	1	0.43		—		1	1.07
<i>Pogonius transfuga</i>	2	0.48	0.47–0.48	1	0.70	1	1.18
<i>Pogonius meridionalis</i>	4	0.46	0.45–0.48	1	0.69	1	1.13
<i>Pogonius punctulatus</i>	2	0.36	0.35–0.38	1	0.51	1	0.63
<i>Pogonius cumanus</i>	1	0.56		—		1	1.35
<i>Pogonistes rufocinctus</i>	1	0.39		1	0.54	1	0.70
<i>Pogonistes convexitollis</i>	2	0.34	0.33–0.34	1	0.50	1	0.62
<i>Pogonistes angustus</i>	2	0.32	0.30–0.33	2	0.41	1	0.57
<i>Cardiaderus chloroticus</i>	2	0.50	0.47–0.52	1	0.81	1	1.10
<i>Thalassotrechus barbarae</i>	1	0.46		—		—	

chus (Fig. 6). Antennae slightly longer than mandibles in most species; second antennomere 0.7–1.0× as long as first; third antennomere 1.1–1.3× as long as first; fourth antennomere 0.6–0.9× as long as first; antennomere 3 with prominent sensorium (sensorial appendage of Van Emden 1942), two campaniform and one placoid sensilla laterally; antennomere 4 with two conical and one campaniform sensilla apically; lateral side of antennomere 3 not sclerotized between sensorium and base of antennomere 4. Mandible with single retinaculum; penicillus with more than 5 setae; cutting edges of terebra and retinaculum smooth, not serrate (Figs 2–9); dorsal surface between  $MN_6$  and  $MN_7$  with or without microdenticles. Maxilla without lacinia; stipes about 2.2–3.0× as long as wide; dorsal surface of stipes membranous, not sclerotized; first galeomere 1.0–1.2× as long as second; maxillary palpomere 4 not subdivided. Labium with relatively long, conical ligula; second labial palpomere not subdivided, slightly shorter than first. Leg with single, relatively long claw (Figs. 15–16). Urogomphi fused to ninth tergite, rather long, not joined, without nodules.

**Chaetotaxy.** All primary sensilla, except pores  $PR_6$ ,  $PR_7$ ,  $PR_8$ ,  $PR_9$  in some taxa also  $PR_{10}$ , on pronotum, pores  $ME_8$ ,  $ME_9$  on meso- and metanotum, seta  $ES_1$  on metathorax, pore  $TE_6$  on abdominal tergites 1–8, and setae  $TA_3$ ,  $TA_4$ ,  $TA_5$  and  $TA_6$  on tarsus, present; no additional sensilla. Seta  $FR_1$  close to  $FR_2$ ; anterior angles of hypopharynx each with one seta; setal group  $gMX$  with 14–30 (usually less than 24) setae; setae  $MX_3$  and  $MX_4$  relatively long and subequal in length; seta  $MX_5$  about half length of galeomere 2; seta  $MX_5$  located at base of galeomere 2; seta  $LA_5$  located on ligula, which is quadrisetose. Setae  $PR_7$  and  $ME_{10}$  on thorax short, not longer than basal diameter of nearest long setae; length of setae  $PR_{13}$  and  $ME_{14}$  0.4–0.7× that of  $PR_{12}$  and  $ME_{13}$  respectively; seta  $ES_1$  spindle-shaped; seta  $EM_1$  spindle-shaped except in *Pogonistes*. Seta  $TA_1$  usually located at basal third of tarsus, rarely at middle. Abdomen with setae  $TE_6$ ,  $TE_7$ ,  $TE_{11}$  and  $ST_1$  spindle-shaped in many taxa. Seta  $EP_1$  on epipleurites of ninth abdominal segment and seta  $PY_2$  on pygidium spindle-shaped.

**Second- and third-instar larvae.** Same character states as first instar except for the followings. Antennae with second antennomere 0.9–1.6× as long as first; third antennomere 1.1–1.5× as long as first; fourth antennomere 0.5–0.8× as long as first. Mandible without microdenticles on dorsal surface between pore  $MN_6$  and seta  $MN_7$ . Maxillae with dorsal surface of stipes partly sclerotized; stipes 3.5–5.5× as long as wide.

**Chaetotaxy.** Primary setae on frontale usually trichoid ( $FR_1$  and  $FR_2$  spindle-shaped in some specimens); frontale with numerous short, irregular, secondary setae, some of them spindle-shaped. Antenna without secondary setae (Figs 21, 24–25) or with secondary setae on antennomeres 1–3



(Figs 22–23), in some taxa on antennomere 2 only (Fig. 26). Mandible with 2 or 3 secondary setae laterally at base. Maxilla with group gMX consisting of 20–65 setae, lateral side of stipes with 5–7 setae (including MX<sub>2</sub> and MX<sub>3</sub>), setae MX<sub>3</sub> and MX<sub>4</sub> long (length 1.5–2.5× width of stipes). Labium with 3–22 setae on each side (including LA<sub>3</sub> and LA<sub>4</sub>). Leg without secondary setae in most species, rarely femur, tibia, and tarsus with short secondary setae. Seta UR<sub>4</sub> on abdominal tergite IX distinct, urogomphi each with 7 long setae (UR<sub>4</sub>–UR<sub>8</sub>, UR<sub>8</sub>, UR<sub>9</sub>), lateral margins of tergite IX without secondary seta at middle (just anterior to UR<sub>7</sub>).

**BIOLOGICS.** Although the habitat preferences of Pogonini larvae are inadequately known, one can assume that larvae of most species prefer saline places like the adults. In laboratory, we were able to obtain eggs of many species only after table salt was added to the substratum in the Petri dishes containing the adults. Most first-instar larvae were obtained in laboratory in June, usually right after the adults were brought from the field. It takes about three to four weeks for the larval development to be completed. All species collected in the field were successfully reared, except *Pogonus litoralis*.

**MONOPHYLY.** Larval features suggest that the tribe Pogonini represents a monophyletic lineage. Known larvae possess three character states which are likely apomorphic: 1) Some setae on the body are spindle-shaped instead of trichoid. No other Trechitae larvae possess such setae and their occurrence is rare in other groups of Carabidae. 2) Seta FR<sub>2</sub> on frontale is located closer to FR<sub>1</sub> than on average for Trechitae and most other groups of Carabidae (our observations). 3) Pogonine larvae lack a relatively long, secondary seta on each lateral margin of the ninth abdominal tergite (just anterior to UR<sub>7</sub>) in second and third instars which is present in all other genera of Trechitae studied except *Ocys*, *Tachyta*, *Oopterus*, and *Idacurabus*. This character state has been little surveyed in other groups of Carabidae.

**PHYLOGNETIC RELATIONSHIPS.** Larval features of Pogonini support their inclusion in the supertribe Trechitae. Pogonine larvae share with those of the remaining Trechitae groups the absence of pores PR<sub>1</sub>, PR<sub>2</sub>, PR<sub>3</sub>, PR<sub>4</sub> on pronotum, pores Me<sub>4</sub> and ME<sub>5</sub> on meso- and metanotum, seta ES<sub>1</sub> on metathorax, pore TL<sub>2</sub> on abdominal tergites 1–8, and setae TA<sub>3</sub>, TA<sub>4</sub>, TA<sub>5</sub>, TA<sub>6</sub> on tarsus. These structures are part of the ground plan of the family Carabidae (Bousquet & Goulet 1984) and their absence in Trechitae larvae is very likely a synapomorphic condition.

One additional character state should be mentioned: the presence of a single claw at the extremity of the leg. This state, which is undoubtedly derived for the family Carabidae, occurs in all Trechitae larvae except for those of the genera *Perileptus*, *Thalassophilus*, *Amblystogenum*, *Temnostega*, and *Kenodactylus* Broun, 1909 which have two claws (Boidon 1936, Womersley 1937, Johns 1974, Grebennikov 1996, our observations). These genera belong to the subtribes Perileptina, Trechodina, Plocamotrechina, and Aepina (last two) respectively of the tribe Trechini. Reversal from one to two claws within the Trechini is unlikely in our opinion. Therefore, we must assume that the presence of one claw has been derived at least twice in the Trechitae, once in the tribe Trechini and a second time in the remaining groups. In such case, the Pogonini may be more closely related to Bembidini and Zolini. The fact that a few other groups of Carabidae, apparently not closely related to the Trechitae such as some genera of Clivinini and the Broscini, do possess a single claw suggests that this character state may be subject to convergence in carabids. Another possibility is that the tribe Trechini is not a monophyletic lineage. We cannot comment on this hypothesis at this point.

Muller (1975) postulated that the tribe Pogonini is the adelphotaxon of Bembidini. This view was based, in our opinion, on "weak" synapomorphies and has not been corroborated. As properly stated by Maddison (1993–1996), relationships of the various tribes of Trechitae have not been adequately demonstrated.

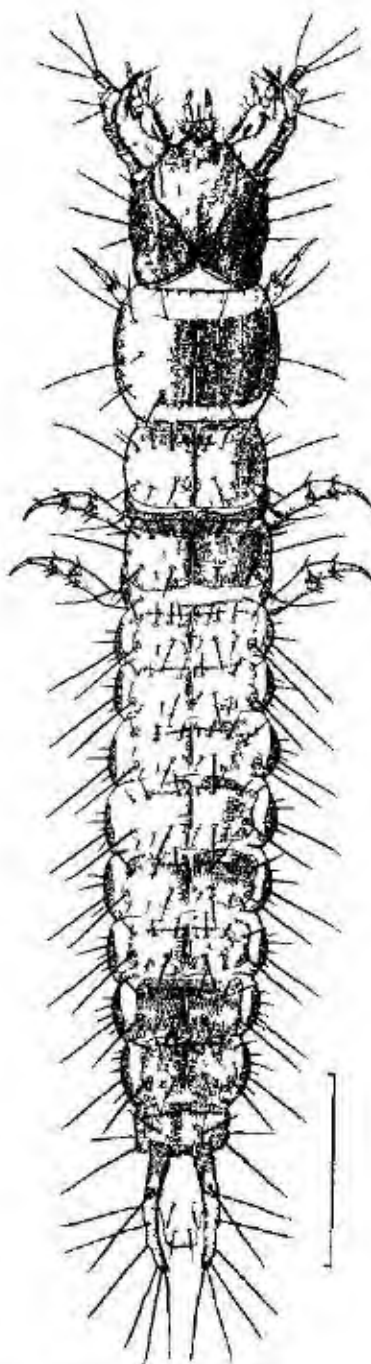


Fig. 1 Larva of *Pogonius meridionalis*, L<sub>2</sub> habitus. Scale bar = 1 mm.

### Key to larvae of the tribe Pogonini

- 1 Urogomphus with 5 long setae (Figs 18–20). Mandible with one seta on basal half (Figs 2–9). Lateral side of stipes with 2 setae. Abdominal hypopleurites without setae. .... First instar. .... 2
- Urogomphus with 7 long setae (Fig. 1). Mandible with more than one seta on basal half (Figs 24–26). Lateral side of stipes with more than 2 setae. Abdominal hypopleurites with setae. .... Second and third instars. .... 3
- 2 Dorsal surface of mandible between  $MN_6$  and  $MN_7$  with at least one microdenticle, usually 3–6 (Figs 2–4). Seta  $PY_6$  on pygidium spindle-shaped. .... *Pogonus* Dejean
- Dorsal surface of mandible between  $MN_6$  and  $MN_7$  smooth, without microdenticles (Figs 5–9). Seta  $PY_6$  on pygidium trichoid. .... 3
- 3 Length of setae  $MX_{11}$  and  $MX_{12}$  more than half diameter of maxillary palpomere 3. Parietale with posterior row of ocelli somewhat reduced or absent. .... *Pogonistes* Chaudoir
- Length of setae  $MX_{11}$  and  $MX_{12}$  less than 1/4 diameter of maxillary palpomere 3. Parietale with posterior row of ocelli markedly developed. .... 4
- 4 Parietale with egg-bursters consisting of one large microspine on each side near epicranial suture (Fig. 6). Mandibular terebra slightly convex near base (Fig. 6). Pore  $PR_1$  on pronotum absent. Setae  $TE_1$  on tergites spindle-shaped. .... *Thalassotrechus* Van Dyke
- Parietale without egg-bursters (Fig. 5). Mandibular terebra regular, slightly concave (Fig. 5). Pore  $PR_1$  on pronotum present. Setae  $TE_1$  on tergites normal, trichoid. .... *Cardiaderus* Dejean
- 5 Antennae with secondary setae on antennomere 2 only (Fig. 26). Length of setae  $MX_{11}$  and  $MX_{12}$  less than 1/4 diameter of maxillary palpomere 3. Meso-, metanotum, and abdominal tergites 1–6 with numerous secondary setae on medial half (Fig. 27). .... *Cardiaderus* Dejean
- Antennae without secondary setae (Figs 21, 23) or antennomeres 1–3 with secondary setae (Figs 22, 23). Length of setae  $MX_{11}$  and  $MX_{12}$  more than half diameter of maxillary palpomere 3. Meso-, metanotum, and abdominal tergites 1–6 with no or few secondary setae on medial half. .... *Pogonus* Dejean and *Pogonistes* Chaudoir

### Genus *Pogonus* Dejean, 1821

(Figs 1–4, 10, 19, 21–25)

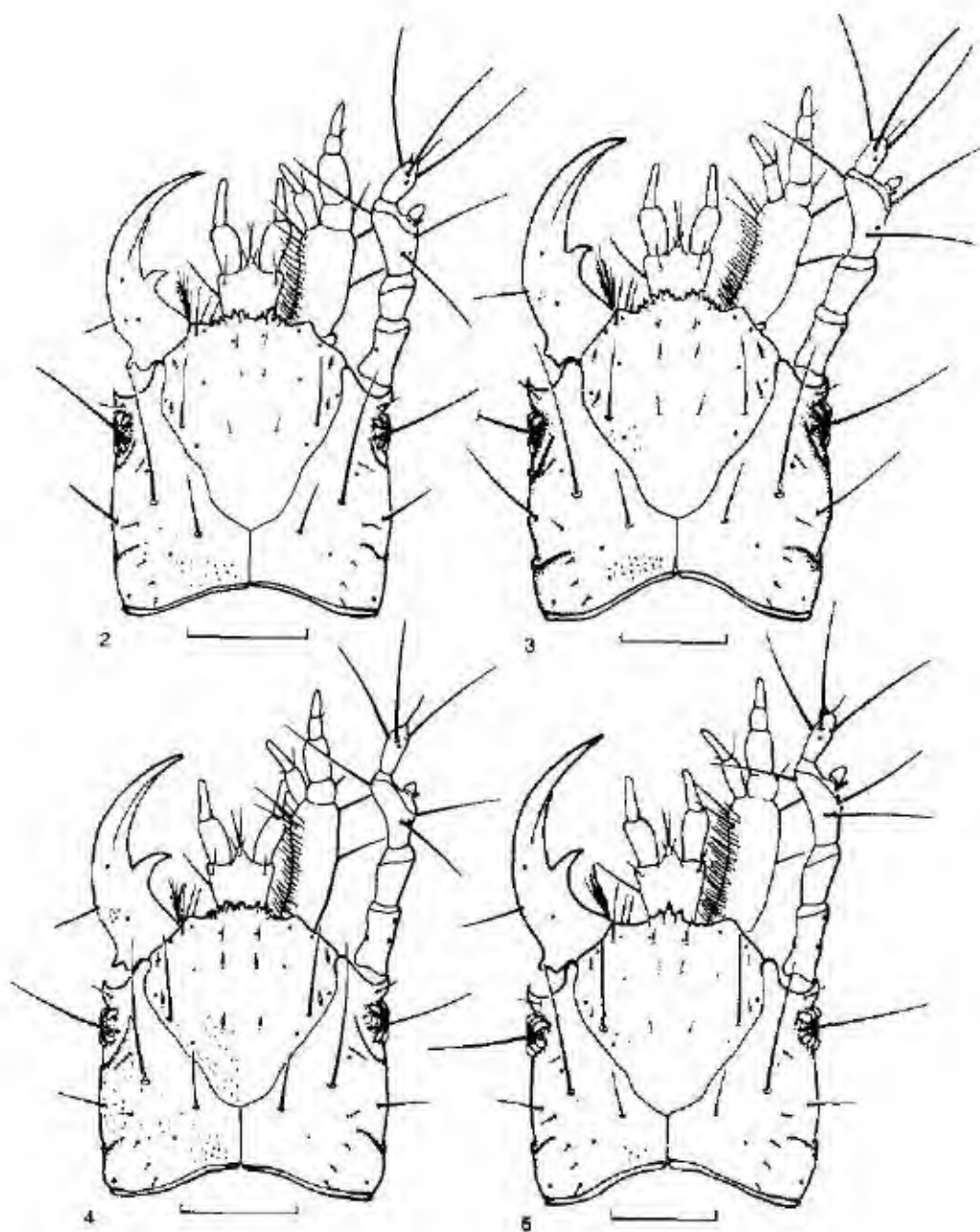
**DIAGNOSIS.** First-instar larvae of *Pogonus* differ from those of other genera by having microdenticles on the dorsal surface of the mandible between  $MN_6$  and  $MN_7$  and by having the seta  $PY_6$  on the pygidium spindle-shaped. We have found no character state that would differentiate second- and third-instar larvae of *Pogonus* from those of *Pogonistes*.

**DESCRIPTION. First-instar larvae.** Cephalic capsule parallel-sided (Figs 2–4). Frontale with or without pointed microsculpture, if present, microsculpture developed on basal half of sclerite (Fig. 4) or near pore  $FR_6$  (Fig. 3); nasale rather straight or slightly notched at middle (Figs 10, 11). Parietale without egg-bursters (Figs 2–4); ocelli, postocellar and cervical grooves markedly developed (Figs 2–4). Mandible with pointed microsculpture between  $MN_6$  and  $MN_7$  consisting of 1–8, usually 3–6, sharp microdenticles (Figs 2–4); terebra regular, slightly concave (Figs 2–4). Claw 0.8–1.0× length of tarsus. Urogomphi relatively long, parallel (Fig. 19).

**Chaetotaxy:** Seta  $AN_6$  1.0–2.0× as long as width of antennomere 4 (Figs 2–4). Frontale with at least 2 setae,  $FR_1$  and either  $FR_3$ ,  $FR_4$ , or  $FR_6$ , spindle-shaped; seta  $EM_1$  on prothorax and  $PY_6$  on pygidium spindle-shaped; length of setae  $MX_{11}$  and  $MX_{12}$  more than half diameter of maxillary palpomere 3. Pore  $PR_1$  on pronotum present. Seta  $TA_1$  located at basal third of tarsus (as in Fig. 15). Setae  $TE_1$  on tergites normal, not spindle-shaped.

**Second- and third-instar larvae.** Postocellar and cervical grooves distinct.

**Chaetotaxy:** antennomeres 1–3 with (Figs 22, 23) or without secondary setae (Figs 21, 24). Leg without secondary setae on tarsus, tibia and femur in all species studied except *P. cumanus*. Meso-, metanotum, and abdominal tergites 1–6 without numerous secondary setae on medial half of sclerites (Fig. 1).



Figs 2-5. Cephalic capsule, right antenna, left mandible, right maxilla, labium, L<sub>1</sub> (dorsal view). 2 - *Pogonius punctulatus*; 3 - *P. cumulus*; 4 - *P. luridipennis*; 5 - *Cardiaderus chloroticus*. Scale bars = 0.2 mm.

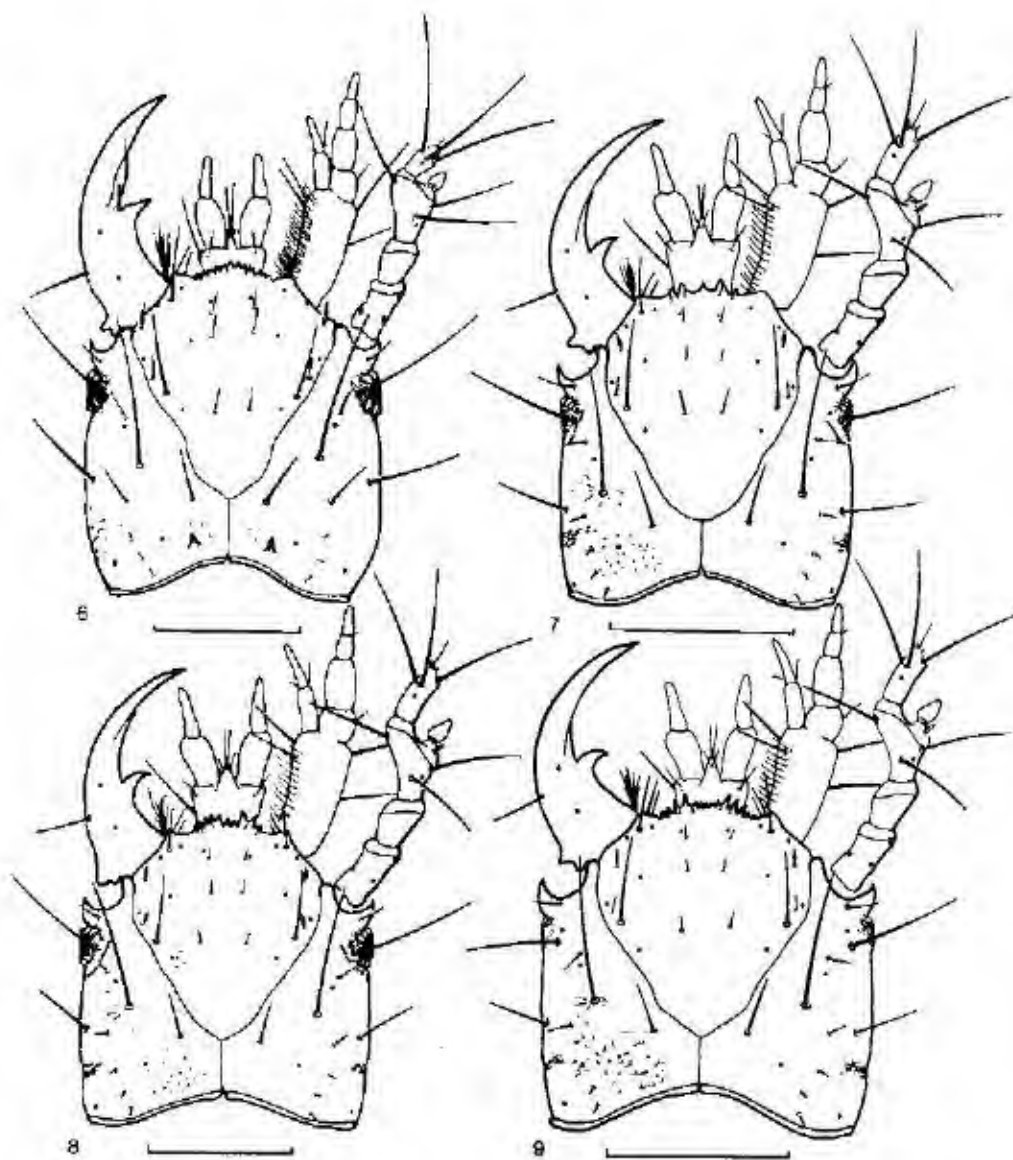
**MONOPHYLY AND PHYLOGENETIC RELATIONSHIPS.** In their taxonomic review of the New World *Pogonini*, Bousquet & Laplante (1997) found no synapomorphy for the genus *Pogonus* based on a limited number of species. They concluded that the genus, as presently conceived, may not be a monophyletic lineage. Known larvae of *Pogonus* share one apomorphic character state: in the first instar, the seta  $PY_6$  on the pygidium is spindle-shaped instead of being trichoid. The presence of pointed microsculpture on the dorsal surface of the mandible of the first instar could represent another synapomorphy for the genus *Pogonus*. However, the transformation polarity of the character is difficult to assess. Presence of this feature occurs in several lineages within the supertribe Trechinae. Overall, evidence of monophyly for the genus *Pogonus* based on larval morphology is not overwhelming.

Among the genera treated here, *Pogonus* is probably more closely related to *Pogonistes* than to the other two genera. Larvae of *Pogonus* and *Pogonistes* have relatively long setae  $MX_{11}$  and  $MX_{12}$  on maxillary palpomere 3 (at least half width of the palpomere). This character state is rarely found in carabids, where these setae are extremely small. Relatively long setae  $MX_{11}$  and  $MX_{12}$  is likely the apomorphic state but its presence in the genus *Asaphidion* (see Maddison 1993: 153) suggests that it could be subject to convergence. The fact that no character state was found to separate second- and third-instar larvae of *Pogonus* from those of *Pogonistes* suggests also, in a way, that the two genera may be closely related.

**MATERIAL STUDIED.** *Pogonus luridipennis* (Germar, 1822): 2 $L_1$ , 1 $L_2$ , 1 $L_3$  (mounted on slide) reared from adults collected at Sarepta, Volgograd area, Russia on May 23, 1995 (VVG). *Pogonus iridipennis* Nicolas, 1822: 1 $L_1$ , 1 $L_2$  (mounted on slide) reared from adults collected at Dnestrovsky Liman, Odessa distr., Ukraine on April 26, 1995 (VVG). *Pogonus transfuga* Chaudoir, 1870: 2 $L_1$ , 1 $L_2$ , 1 $L_3$  (mounted on slide) reared from adults collected at Baskunchak Lake, Astrakhan distr., Russia on May 25, 1995 (VVG); 1 $L_1$  (mounted on slide) reared from adults collected at Sarepta, Volgograd area, Russia on May 23, 1995 (VVG); additional material reared but not studied in detail includes 6 $L_1$ , 2 $L_2$ , and 1 $L_3$  (adults from Baskunchak Lake) (VVG). *Pogonus meridionalis* Dejean, 1828: 2 $L_1$ , 1 $L_2$ , (mounted on slide) reared from adults collected at Dnestrovsky Liman, Odessa distr., Ukraine on April 26, 1995 (VVG); 2 $L_1$ , 1 $L_2$  (mounted on slide) reared from adults collected at Kuyalinsky Liman, Odessa distr., Ukraine on April 28, 1995 (VVG); additional material reared but not studied in detail includes 7 $L_1$ , 3 $L_2$ , 1 $L_3$  (BMNH, VVG). *Pogonites punctulatus* Dejean, 1828: 2 $L_1$ , 1 $L_2$ , 1 $L_3$  (mounted on slide) reared from adults collected at Dnestrovsky Liman, Odessa distr., Ukraine on April 26, 1995 (VVG); 4 $L_1$  (mounted on slide) reared from adults collected at Sarepta, Volgograd area, Russia on May 23, 1995 (VVG); additional material reared but not studied in detail includes 3 $L_1$  and 1 $L_2$  (VVG). *Pogonus cumanus* Lutshnik, 1916: 1 $L_1$  (mounted on slide) reared from adults collected at Kuyalinsky Liman, Odessa distr., Ukraine on April 28, 1995 (VVG); 1 $L_2$  (mounted on slide) collected with adults and identified by association (VVG).

**GEOGRAPHICAL DISTRIBUTION AND DIVERSITY.** The genus *Pogonus* includes about 45 species which are distributed worldwide, except in the Neotropical Region, but are most diverse in the Mediterranean area (Kryzhanovskij 1983; Bousquet & Laplante 1997) than anywhere else.

**REMARKS.** Second- and third-instar larvae of two species of *Pogonus*, namely *P. cumanus* and *P. punctulatus*, are easily recognized among the species studied in having secondary setae on antennomeres 1–3 (Figs 22, 23). Additionally, the single third-instar larva of *P. cumanus* we have studied is unique for the presence of secondary setae on the femur (8–9 setae), tibia (3–7 setae) and basal part of tarsus (2–4 setae). First-instar larvae of *P. punctulatus* differ readily from the other species studied by the absence of microsculpture on frontale and by the presence of only one microdenticle on the dorsal surface of the mandible between  $MN_5$  and  $MN_7$ . Larvae of other *Pogonus* species have pointed microsculpture in the basal part of the frontale and from 3 to 8 microdenticles on the dorsal surface of the mandible.



Figs 6-9. Cephalic capsule, right antenna, left mandible, right maxilla, labium,  $L_1$  (dorsal view). 6 - *Thalassotrechus barbarus*; 7 - *Pogonistes angustus*; 8 - *P. rufocaudatus*; 9 - *P. convexicollis*. Scale bars = 0.2 mm.



### Genus *Pogonistes* Chaudoir, 1871

(Figs 7–9, 11–12, 18)

**DIAGNOSIS.** First-instar larvae of *Pogonistes* differ from those of other genera treated in having the seta  $EM_1$  on prothorax normal, trichoid. Second- and third-instar larvae cannot be separated from those of *Pogonus*.

**DESCRIPTION. First-instar larvae.** Cephalic capsule parallel-sided (Figs 7–9). Frontale without microsculpture (Figs. 7, 9) or with pointed microsculpture restricted to near pore  $FR_6$  (Fig. 8); nasale rather straight at middle (Fig. 12). Parietale without egg-bursters (Figs 7–9); ocelli, postocellar and cervical grooves less distinct than in *Pogonus* (Figs 7–8) or posterior row of ocelli and postocellar groove absent (Fig. 9). Mandible without microdentacles between  $MN_6$  and  $MN_1$  (Figs 7–9); terebra regular, slightly concave (Figs 7–9). Claw  $0.9–1.0\times$  length of tarsus. Urogomphi relatively short, parallel (Fig. 18).

**Chaetotaxy:** Seta  $AN_6$   $1.0–1.5\times$  as long as width of antennomere 4 (Fig. 7). Frontale with at least seta  $FR_6$  spindle-shaped; seta  $EM_1$  on prothorax,  $TE_2$  on abdominal tergites, and  $PY_6$  on pygidium normal, trichoid; length of setae  $MX_{11}$  and  $MX_{12}$  at least half diameter of maxillary palpomere 3. Pore  $PR_6$  on pronotum present. Seta  $TA_1$  located at basal third of tarsus (as in Fig. 15).

**Second- and third-instar larvae.** Postocellar and cervical grooves distinct.

**Chaetotaxy:** Antennae and legs without secondary setae. Meso-, metanotum, and abdominal tergites 1–6 without numerous secondary setae on medial half of sclerites.

**MONOPHYLY AND PHYLOGENETIC RELATIONSHIP.** We found no larval synapomorphy among the species studied to support the view that the genus is monophyletic. Second- and third-instar larvae of *Pogonistes* are similar to those of *Pogonus*. In addition, larvae of both genera share the presumably apomorphic condition of relatively long setae  $MX_{11}$  and  $MX_{12}$  on maxillary palpomere 3. As stated previously *Pogonistes* is probably more closely related to *Pogonus* than to the other genera treated.

**MATERIAL STUDIED:** *Pogonistes rufocinctus* (Dejean, 1828):  $1L_1$ ,  $2L_2$ ,  $1L_3$  (mounted on slide) reared from adults collected at Sarepta, Volgograd area, Russia on May 23, 1995 (VVG);  $2L_1$ ,  $2L_2$ ,  $1L_3$  reared from adults collected in the Kura Kum Desert, Uzboy Lakes system, Turkmenia on April 28, 1995 (CNC); additional material reared but not studied in detail includes  $4L_1$  and  $1L_2$  (VVG). *Pogonistes convexicollis* Chaudoir, 1871:  $2L_1$ ,  $1L_2$ ,  $1L_3$  (mounted on slide) reared from adults collected at Kuyalinsky Loman, Odessa distr., Ukraine on April 28, 1995 (VVG); additional material reared but not studied in detail includes  $1L_2$  (VVG). *Pogonistes angustus* (Gobler, 1836):  $2L_1$ ,  $2L_2$ ,  $1L_3$  (mounted on slide) reared from adults collected at Kuyalinsky Loman, Odessa distr., Ukraine on April 28, 1995 (VVG); additional material reared but not studied in detail includes  $8L_1$  and  $4L_2$  (VVG).

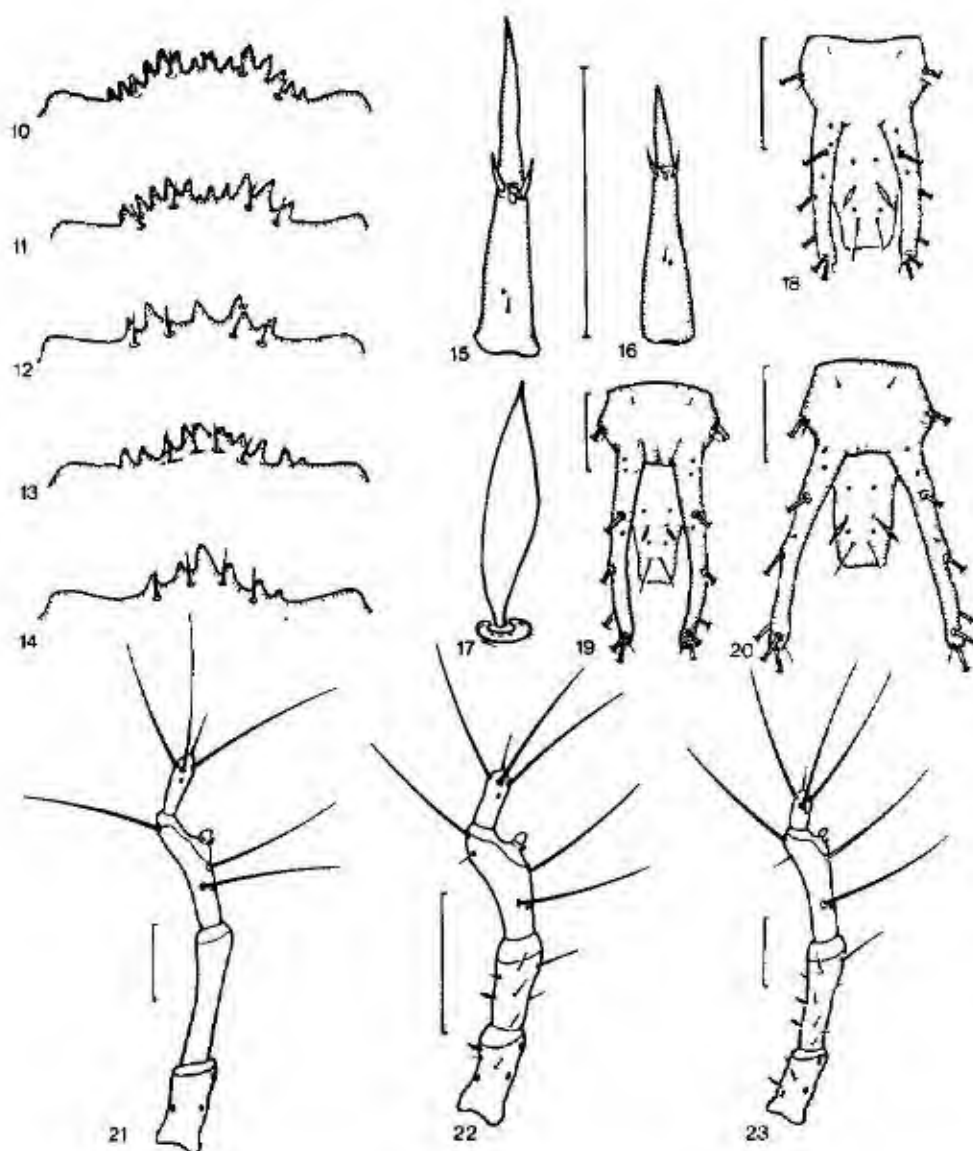
**GEOGRAPHICAL DISTRIBUTION AND DIVERSITY.** The genus *Pogonistes* includes about 10 species in the Mediterranean area (Kryzhanovskij 1983).

### Genus *Cardiaderus* Dejean, 1828

(Figs 5, 14, 15, 26, 27)

**DIAGNOSIS.** Larvae of *Cardiaderus* are differentiated from those of other members of Pogonini by the character states listed in the key and by having, in the second and third instars, numerous secondary setae located on the medial half of the meso-, metanotum, and abdominal tergites. Furthermore the antennomere 2 bears secondary setae while the antennomeres 1 and 3 have no such setae. Only some members of the genus *Pogonus* also possess secondary setae on antennomere 2 but in these species the antennomeres 1 and 3 bear secondary setae.

**DESCRIPTION. First-instar larvae.** Cephalic capsule parallel-sided (Fig. 5). Frontale with pointed microsculpture near pore  $FR_6$  (Fig. 5); nasale with 6–7 teeth, median one somewhat more protruding



Figs 10-23. 10-14, nasale, L, (dorsal view) 10 - *Pogonius luridipennis*, 11 - *Pogonistes rufogaeus*, 12 - *P. angustus*, 13 - *Thalassotrechus barbarae*, 14 - *Cardiaderus chloroticus* 15-16, tarsus and claw, L, (dorsal view) 15 - *Cardiaderus chloroticus*, 16 - *Thalassotrechus barbarae* 17 - spindle-shaped seta 18-20, urogomphi and pygidium, L, (dorsal view) 18 - *Pogonistes convexitollis*, 19 - *Pogonius luridipennis*, 20 - *Thalassotrechus barbarae* 21-23, right antenna, L, (dorsal view) 21 - *Pogonius luridipennis*, 22 - *P. punctulatus*, 23 - *P. cumunus* Scale bars = 0.2 mm

than others (Fig. 14). Parietale without egg-bursters (Fig. 5); ocelli and cervical groove markedly developed (Fig. 5); postocellar groove absent. Mandible without microdenticles between  $MN_6$  and  $MN_7$  (Fig. 5); terebra regular, slightly concave. Claw as long as tarsus (Fig. 15). Urogomphi relatively long, parallel (as in Fig. 19).

**Chaetotaxy:** Seta  $AN_6$  1.0–1.3× as long as width of antennomere 4 (Fig. 5). Frontale without spindle-shaped setae; seta  $EM_1$  on prothorax spindle-shaped; setae  $TE_7$  on abdominal tergites and  $PY_6$  on pygidium normal, trichoid; length of setae  $MX_{11}$  and  $MX_{12}$  less than 0.25× diameter of maxillary palpomere 3. Pore  $PR_6$  on pronotum present. Seta  $TA_1$  located at basal third of tarsus (Fig. 15).

**Second- and third-instar larvae.** Postocellar groove distinct; cervical groove absent.

**Chaetotaxy:** Antenna with secondary setae on antennomere 2 only (Fig. 26). Legs without secondary setae on tarsus, tibia and femur. Meso-, metanotum, and abdominal tergites 1–6 with numerous, more or less long, secondary setae on medial half of sclerites (Fig. 27).

**PHYLOGENETIC RELATIONSHIP.** Second- and third-instar larvae of the genus *Cardiaderus* show two apomorphic character states: the meso-, metanotum, and abdominal tergites bear numerous secondary setae on the medial half of the tergites (Fig. 27) and the antennomere 2 has secondary setae (Fig. 26). The last feature is shared with some species of *Pogonus* (*P. cumanus* and *P. punctulatus*). However, we believe that the presence of this state in both taxa appeared independently. For example, presence of secondary setae on the antennomere 2 has appeared in several lineages within the tribes Pterostichini (Bousquet 1985), Bembidiini and Trechini (our observations). Relationships of the genus *Cardiaderus* are uncertain.

**MATERIAL STUDIED.** *Cardiaderus chloroticus* (Fischer von Waldheim, 1823): 2L<sub>1</sub>, 1L<sub>1</sub>, 1L<sub>2</sub> (mounted on slide) reared from adults collected at Kuyalmsky Leman, Odessa distr., Ukraine on April 28, 1995 (VVG); additional material reared but not studied in detail includes 7L<sub>1</sub>, 4L<sub>2</sub>, 5L<sub>3</sub> (VVG, CNC, BMNH).

**GEOGRAPHICAL DISTRIBUTION AND DIVERSITY.** The genus *Cardiaderus* includes a single species, *C. chloroticus*, which is distributed throughout the steppe and semi-desert areas of Palearctic Region from Romania and Bulgaria to eastern Kazakhstan and the Altai (Kryzhanovskij 1983).

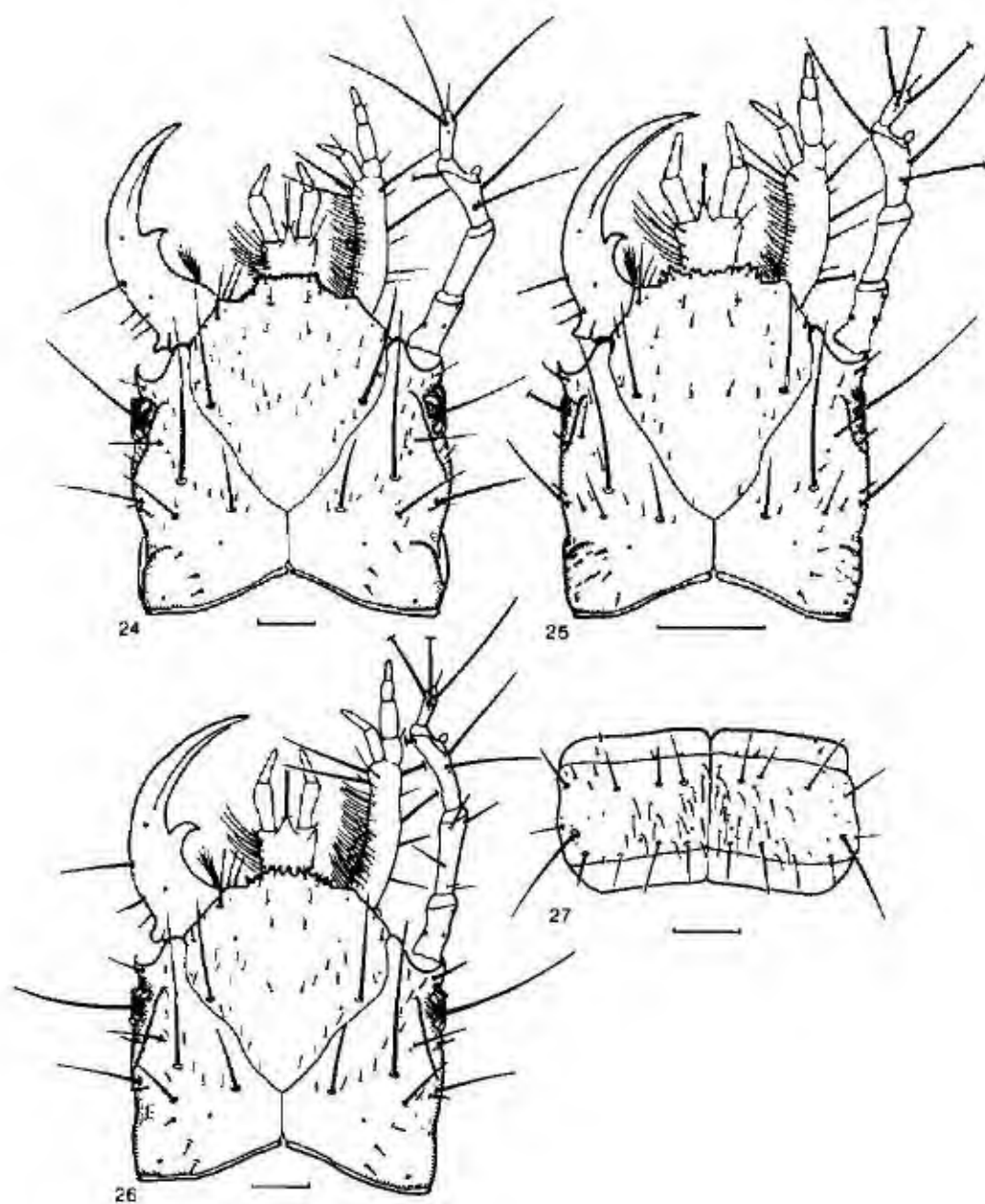
#### **Genus *Thalassotrechus* Van Dyke, 1918** (Figs 6, 13, 16, 20)

**DIAGNOSIS.** First-instar larvae of *Thalassotrechus* are unique among the species studied by the rounded lateral sides of the cephalic capsule, by the absence of cervical grooves; by the presence of egg-bursters on the parietale, by the absence of pore  $PR_6$ , by the short claw, by the position of the seta  $TA_1$  which is at middle of the tarsus, and by the spindle-shaped setae  $TE_7$  on tergites 1–8.

**DESCRIPTION. First instar larvae.** Cephalic capsule with rounded lateral sides (Fig. 6). Frontale without microsculpture (Fig. 6); nasale slightly protruding at middle (Fig. 13). Parietale with egg bursters consisting of one large tooth on each side near epicranial suture (Fig. 6); ocelli developed (Fig. 6); postocellar and cervical grooves absent (Fig. 6). Mandible without microdenticles between  $MN_6$  and  $MN_7$ ; medial margin of terebra slightly convex near base (Fig. 6). Claw about 0.5× length of tarsus (Fig. 16). Urogomphi relatively long, divergent (Fig. 20).

**Chaetotaxy:** Length of seta  $AN_6$  1/4–1/3 width of antennomere 4 (Fig. 6). Frontale with seta  $FR_6$  spindle-shaped; seta  $EM_1$  on prothorax spindle-shaped; length of setae  $MX_{11}$  and  $MX_{12}$  less than 0.25× diameter of maxillary palpomere 3. Pore  $PR_6$  on pronotum absent. Seta  $TA_1$  located at middle of tarsus (Fig. 16). Setae  $TE_7$  on tergites 1–8 spindle-shaped; seta  $PY_6$  on pygidium normal, trichoid.

**Second- and third-instar larvae.** Unavailable. Superficially described by Moore (1956).



Figs 24-27 24-26, cephalic capsule, right antenna, left mandible, right maxilla, labium, L<sub>1</sub> (dorsal view): 24 - *Pogonius transfuga*, 25 - *Pogonistes angustus*, 26 - *Cardiaderus chloroticus* 27 - first abdominal segment of *Cardiaderus chloroticus*, L<sub>1</sub> (dorsal view) Scale bars = 0.2 mm

**PHYLOGENETIC RELATIONSHIP** Bousquet & Laplante (1997) indicate that adults of *T. barbarae* possess several autapomorphies within the tribe Pogonini. A similar statement could be made for the first instar larvae. The presence of egg-bursters on the parietale, comparatively short seta AN<sub>6</sub>, absence of pore PR<sub>6</sub>, absence of cervical grooves, and spindle-shaped setae TE<sub>7</sub> are character states which are unique, and probably apomorphic, to *T. barbarae*. Relationships of the genus remain uncertain.

**MATERIAL STUDIED** *Thalassotrechus barbarae* (G. H. Horn, 1892) 2L (mounted on slide) reared by W.G. Evans from adults collected at Pacific Grove, Monterey Bay, California (CNC).

**GEOGRAPHICAL DISTRIBUTION AND DIVERSITY** The genus *Thalassotrechus* includes a single species, *T. barbarae*, from the Pacific coast of USA and Baja California, Mexico (Bousquet & Laplante 1997).

#### CONCLUDING REMARKS

In general, immature stages of most groups of carabids are poorly known and the tribe Pogonini is no exception. Larvae of eleven species belonging to four genera were studied in the present paper, which account for only about 15% of the world fauna. Larvae of seven genera (*Bedelolus*, *Dioder-carus*, *Diplochaetus*, *Ochtozetus*, *Pogonopsis*, *Syrdenus*, *Olegius*) remain unknown. We hope this modest contribution could stimulate others to study carabid larvae.

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**The dermestid beetles (Coleoptera: Dermestidae: Dermestinae) of Iran.  
Part 1: genus *Dermestes***

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**Abstract.** *Dermestes* (*Dermestinus*) *kafkae* sp. n. and *D.* (*D.*) *intermedius iranicus* ssp. n. from Iran are described and illustrated. *D.* (*D.*) *salskyi* Dalla Torre, 1911 is redescribed and illustrated. Distributional data to 18 *Dermestes* Linnaeus, 1758 species collected by three expeditions to Iran were undertaken by the Department of Entomology to the National Museum (Natural History) in Prague in 1970, 1973 and 1977 and further entomologists are given. A list of all so far known *Dermestes* species from Iran is compiled.

**Taxonomy, new species, new subspecies, distribution, Coleoptera, Dermestidae, *Dermestes*, Palaearctic region**

Some basic information about dermestid beetles from Iran were published in papers by Dalla Torre (1911), Lepesme (1946), Mroczkowski (1968), Sokolov (1972), Zhantiev (1976) and Lafer (1992).

Three expeditions to Iran were undertaken by the Department of Entomology to the National Museum (Natural History) in Prague in 1970, 1973 and 1977, respectively. The basic data about the expeditions, including detailed description of collecting localities (numbering successively), maps and photos can be found in Hoberlandt (1974, 1981, 1983). In this paper, the material of dermestid beetles genus *Dermestes* Linnaeus, 1758 (Coleoptera: Dermestidae: Dermestinae), is elaborated.

Recently some mainly Czech entomologists visited Iran, and an interesting material of *Dermestes* has been slowly accumulated. Although not very large, it contains a few rarely collected species with inadequately known ranges of distribution. An annotated list of findings is presented below.

Through the text, the following abbreviations are used:

ENHM – Hungarian Natural History Museum, Budapest, Hungary (O. Merkl);

JHAC – Jiří Háva, Praha, Czech Republic;

MHNG – Muséum d' Histoire naturelle, Genève, Switzerland (I. Löbl);

MKAC – Marek Kafka, Neratovice, Czech Republic;

MMUE – Museum of Manchester University, Manchester, United Kingdom (C. Johnson);

NHMB – Naturhistorisches Museum, Basel, Switzerland (M. Braneucci);

NHNV – Naturhistorisches Museum, Wien, Austria (H. Schonmann);

NMPC – National Museum, Praha, Czech Republic (J. Jelinek);

SMNS – Staatliches Museum für Naturkunde, Stuttgart, Germany (W. Schawaller);

VKAC – Vladimír Kalík, Pardubice, Czech Republic;

ZMAS – Zoological Museum, Academy of Sciences, St. Petersburg, Russia (M. G. Volkovitsh).

***Dermestes* (*Dermestinus*) *coronatus* Steven in Schönherr, 1808**

**MATERIAL EXAMINED.** Iran, Khorasan, E de Chahen Bid, 37° 26' N – 56° 37' E, 14.vii.1974, 3ex, A. Senglet lgt., V. Kalík det., MHNG; Iran, Mazandaran, O de Buladeh, 2500 m, 6.vii.1975, 1ex, A. Senglet lgt., V. Kalík det., MHNG.

**DISTRIBUTION.** Species known from south-eastern regions of European part of Russia, Caucasus, Turkey, Afghanistan, China: Xinjiang, India, from Iran without detailed data reported by Mroczkowski (1968) and Zhantiev (1976).

***Dermestes (Dermestinus) frischii* Kugelan, 1992**

**MATERIAL EXAMINED.** N Iran, Tohreh, Darakeh, 16 v 1995, 5ex, M. Kafka lgt, J. Háva det., JHAC, MKAC; SE Iran, Baluchistan, Bampur, 2–10 xi 1995, 5ex, M. Kafka lgt, J. Háva det., JHAC; SE Iran, Baluchistan, Chabahar, 10 xi 1995, 31ex, on the dead *Caretta* sp., M. Kafka lgt, J. Háva det., JHAC, MKAC; N Iran, Mazandaran prov., Alborz Mts., 800 m, N slopes, Chalus env., 10.v.1996, 1ex, D. Král lgt, J. Háva det., JHAC; S Iran, Zagros Mts., Boyerahmad-va-Kuhgiluyeh pr., Kuh-e-Dinar ridge, 10 km NE of Yasul, 1800–2500 m, 1–2 v 1996, 1ex, D. Král lgt, J. Háva det., JHAC; N Iran, Tehran pr., Veresk, 800 m, Reshteh Kuhaye Alborz, 2 vii 1970, 4ex, exp. Nat. Mus., V. Kalík det., NMPC; NW Iran, Azarbaijan, Kivi Bala, 21 km W of Khaikhal, 1500 m, 16 vii 1970, 5ex, exp. Nat. Mus., V. Kalík det., NMPC; N Iran, Tehran-Evin, 1700–2000 m, 9–10.iii, 14.iii and 15.iii 1973, 2ex, exp. Nat. Mus., V. Kalík det., NMPC; SE Iran, Baluchistan, 15 km NE of Bandar-e Chah Bahar, 5 iv 1973, 1ex, exp. Nat. Mus., V. Kalík det., NMPC; SE Iran, Baluchistan, Bandar-e Chah Bahar, 5–6 v 1973, 3ex, exp. Nat. Mus., V. Kalík det., NMPC; SE Iran, Baluchistan, Tis, 6–7.iv.1973, 2ex, exp. Nat. Mus., V. Kalík det., NMPC; SE Iran, Baluchistan, 9 km S of Espakeh, 10 iv 1973, 1ex, exp. Nat. Mus., V. Kalík det., NMPC; SE Iran, Baluchistan, Deh Pabid, vicinity on the road between Khash and Zahedan, 21.iv.1973, 2ex, exp. Nat. Mus., V. Kalík det., NMPC; C Iran, Esfahan prov., 30 km S of Robate York, 24 vi.1973, 5ex, exp. Nat. Mus., V. Kalík det., NMPC; S Iran, Fars, Dasht-e Arzhan, 54 km E of Kazerun, 1700 m, 9.vi.1973, 1ex, exp. Nat. Mus., V. Kalík det., NMPC; NW Iran, East Azarbaijan, 30 km NW of Mianch, 5 vii 1973, 35ex, exp. Nat. Mus., V. Kalík det., NMPC; NW Iran, East Azarbaijan, Basmenj, 19 km SE of Tabriz, 27.iii.1977, 2ex, exp. Nat. Mus., V. Kalík det., NMPC; S Iran, Fars, Khormuj, 20 iv 1977, 24ex, exp. Nat. Mus., V. Kalík det., NMPC; Iran, Elburs, Geb. Masandaran, Kojur, on der Strasse sudl. Alandon, 1540 m, Sirokkan, 27 v–31 v.1978, 5ex, Martens & Pieper lgt, J. Háva det., SMNS; Iran, Golhak bei Teheran, iii–v.1961, 33ex, J. Klapperich lgt, V. Kalík det., MHNG, VKAC, NMPC; C Iran, p. Fars, Yasug NV, Sraaz (vill. Kakan), 3040N 5143E, 13 vi 1999, 3ex, P. Kabátek lgt, JHAC.

**DISTRIBUTION.** Cosmopolitan species (Lepesme 1946, Mroczkowski 1968, Zhantiev 1976, Lafer 1992). First record from Iran.

***Dermestes (Dermestinus) intermedius iranica* ssp. n.**

(Fig. 3)

**TYPE MATERIAL.** **Holotype** (male): Iran, Lorestan, Ma Arulan, 6 vii 1973, 33°20'N – 47°54'E, A. Senglet lgt, V. Kalík det. 1979, MHNG. **Allotype** (female): Iran, Bakhtiari, Kuhrang, 19 vi 1974, A. Senglet lgt, V. Kalík det. 1979, MHNG. **Paratypes**: Iran, Bakhtiari, Kuhrang, 19 vi 1974, 1 male/1 female, A. Senglet lgt, V. Kalík det. 1979, MHNG; VKAC, Iran, Azarbaijan, N de Bonab, 4 vi 1975, 1 male/1 female, A. Senglet lgt, V. Kalík det. 1979, MHNG; Iran, Gilan, Umq, Damash, S. Langerud, 2000 m, 17 vii 1975, Hinz lgt, 1 female, J. Háva det., JHAC; Iraq, Baghdad, coll. Kálalová, Paratype *D. intermedius* ssp. ? Kalík det. 1950, 3 male/1 female, Kalík det. 1979, NMPC, VKAC, JHAC; Iraq, Baghdad, V. Kalík det. 1980, MMUE.

**DIFFERENTIAL DIAGNOSIS.** The new subspecies differs from the nominotypical one by narrower body (length: 6–6.7 mm, width: 2.7–3.2 mm), by the pubescence of the body, which is black mixed with sparse pale one, not creating any spots. The aedeagus of the new subspecies is slightly vaulted with small point on inner side of the apical third as (Fig. 3) while it is regularly rounded all along its length in the nominotypical subspecies, as in Figs 1–2). All other morphological characters are the same as in the nominotypical subspecies.

**DISTRIBUTION.** Iran, Iraq.

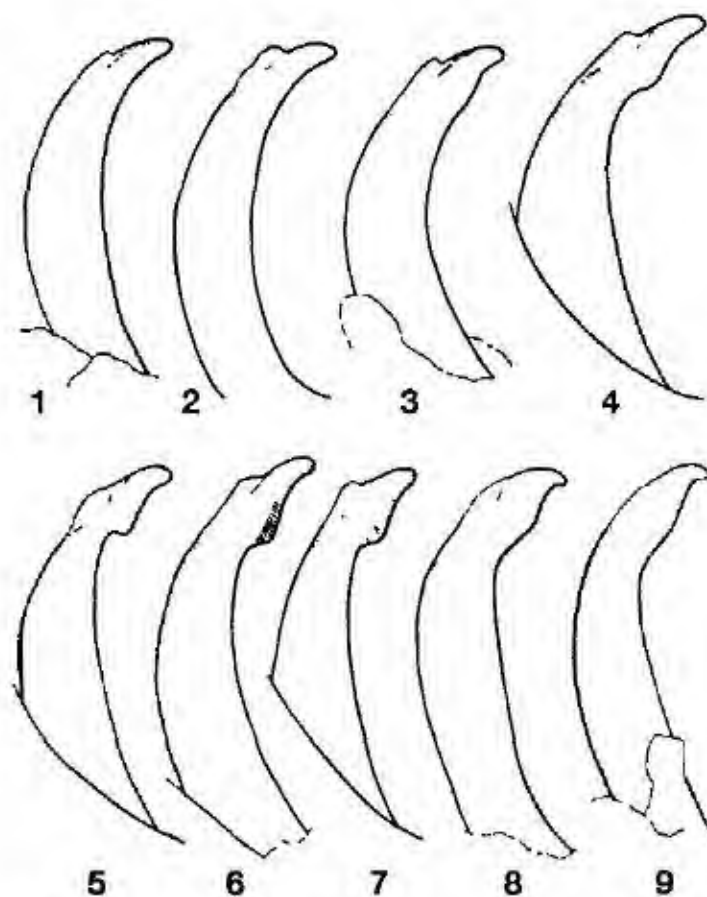
**NAME DERIVATION.** Named after to its occurrence in Iran.

**REMARKS.** Kalík (1951) mentioned 4 specimens of Iraq, Baghdad, Kálalová lgt as "Paratypus *Dermestes intermedius* ssp. ?". The additional more numerous material, which is now at the authors disposal, allows to describe the new subspecies.

*Dermestes (Dermestinus) kaskai* sp. n.  
(Figs 10–12)

TYPE MATERIAL. Holotype (male). N Iran, Chalus – Karaj, Marzan Abad, 3000 m, 18 vi 1997, M. Kafka leg. Holotype deposited in IHAC.

DESCRIPTION. Male. Body black, oval, convex. Body length 7.2 mm. Body width 3.1 mm. Cuticle black, colouring of body surface by dense, coloured pubescence. Head brown-orange hairs, antenna reddish brown, with eleven segments, antennal club from three last segments. Pronotum brown-orange with intermixed black hairs, punctured more closely. Scutellum triangular, with white pubes-



Figs 1–9. Male genitalia (lateral view of median lobe): 1–2. *Dermestes (Dermestinus) intermedius intermedius* Kalik (Hungary), 3. *D. (D.) intermedius iranica* ssp. n. (Iran), 4–7. *D. (D.) kaskai* Kalik (Dalmatia, Caucasus), 8–9. *D. (D.) mustelinus* Erichson (France).

cence. Elytra with wide white basal transverse band, each elytron with black spot near scutellum; posterior part of elytrae uniformly black. Legs reddish brown with yellow pubescence. Ventral part of body densely covered with white and black pubescence. Abdominal sternites with exception of the last one (Fig. 10) white, each with clearly delimited triangular black spot laterally and with two small black spots posteriorly. Sternite IV medially each without a group of erected white setae, oriented posteriad. Last sternite black with two small white spots on anterior margin and with long, yellow hairs on posterior margin. Aedeagus as in (Fig. 12).

Female unknown.

**DIFFERENTIAL DIAGNOSIS.** *Dermestes* (*D.*) *kafkai* sp. n. is habitually, especially in the shape and setation of pronotum, elytra and abdomen very similar to *D. (D.) elegans* Gebler, 1830 and *D. (D.) solskyi*. Main morphological differences are shown in the table.

Species	<i>D. kafkai</i> sp. n.	<i>D. elegans</i>	<i>D. solskyi</i>
head	brown-orange hairs	brown-orange with mixed white and black hairs	yellow hairs
pronotum	brown-orange with inter-mixed black hairs	brown-orange with inter-mixed black and white hairs	yellow-orange with inter-mixed black hairs
elytron	only one black spot near scutellum (Fig. 11) in basal white band; basal white band reaching elytral midlength	two black spots (scutellar and humeral) – Fig. 14) in basal white band; basal white band reaching elytral midlength	no black spots in basal yellow band; basal yellow band (Fig. 17) in basal third of elytra
abdomen	last sternite black with two small white spots anteriorly (Fig. 10), and with long yellow hairs on hind margin	last sternite black with white pattern (Fig. 13) and with black hairs on posterior margin	last sternite black without white spots (Fig. 16), and with long yellow hairs on posterior margin
aedeagus	paramera in lateral view narrower, median lobe less strongly curved, with obtuse apex (Fig. 12)	paramera in lateral view broader, median lobe more strongly curved, almost sharp apex (Fig. 15)	paramera in lateral view broader, median lobe more strongly curved than in <i>D. elegans</i> (Fig. 18)

**DISTRIBUTION.** N Iran.

**NAME DERIVATION.** Dedicated to its collector Marek Kafka, specialist in the family Buprestidae.

#### *Dermestes (Dermestinus) kaszabi* Kalik, 1951

**MATERIAL EXAMINED.** Iran, Azarbaygan, Kalah Arasbaran Wildlife Refuge, 2400–2650 m, 6–10 vi 1978, 2ex, Martens & Pieper lgt., J. Háva det., SMNS, VKAC, Iran, Azarbaygan, Hero Abad, 10.viii 1974, 1ex, A. Senglet lgt., V. Kalik det., MHNG, Iran, Bakhtiari, barrage de Kuhrang, 18 vi 1974, 1ex, A. Senglet lgt., V. Kalik det., MHNG, Iran, Detendero, 2300 m, 24 iv 1970, 1ex, Wittmer & Böhmer lgt., V. Kalik det., NHMB

**DISTRIBUTION.** Species known from Slovakia, Hungary, Romania, Bulgaria, Greece, Dalmatia, Croatia, Bosnia-Herzegovina, Montenegro, Turkey, Caucasus, Armenia, and Armenia (Háva 1999). First record from Iran.

#### *Dermestes (Dermestinus) maculatus* DeGeer, 1774

**MATERIAL EXAMINED.** N Iran, Tehran, Darakeh, 16 v 1995, 1ex, M. Kafka lgt., J. Háva det., JHAC, W Iran, Azarbaygan, Bastam, 1270 m, 30.ix–1.x.1998, 1ex, P. Kabátek lgt., J. Háva det., JHAC, Iran, Sahyvaran, südt. Barm, n 1950, Löffler lgt., Österreichische Iran-Expedition 1949/1950, 1ex, V. Kalik det., NHMV

**DISTRIBUTION.** Cosmopolitan species (Lepesme 1946, Mroczkowski 1968, Zhantiev 1976, Lafer 1992). First record from Iran.

***Dermestes (Dermestinus) murinus murinus* Linnaeus, 1758**

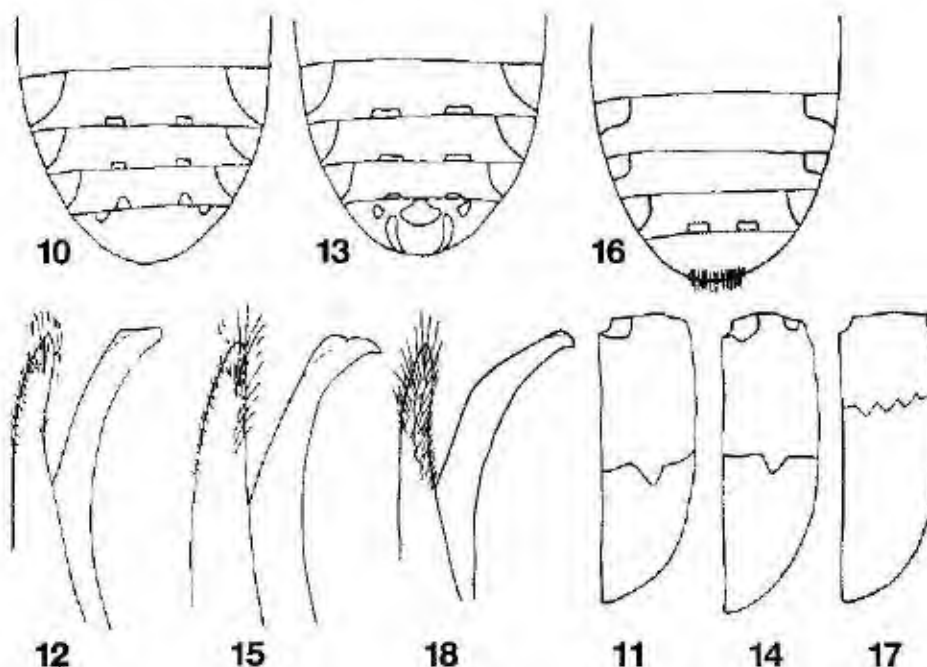
**MATERIAL EXAMINED:** N Iran, Gilan, Sheykh Mahalleh (Assalem), 160 m, 28 vi - 3 vii 1977, 1ex, exp. Nat. Mus., V. Kalik det., NMPC, N Iran, Mazandaran p., Nahav, Honzu 10 km S Gazan, 36 45N 5428E, 15 vi.1999, Sex, on the dry mushrooms, M. Rejzek lgt., J. Hava det., JHAC.

**DISTRIBUTION:** The species distributed in the Palaearctic region (Lepesme 1946, Mroczkowski 1968, Zhantiev 1976, Lafer 1992). First record from Iran.

***Dermestes (Dermestinus) sardous sardous* Küster, 1846**

**MATERIAL EXAMINED:** Iran, Khuzestan, Masjed Soleyman, 20 v 1974, 3ex, A. Senglet lgt., V. Kalik det., VKAC, W Iran, Lorestan prov., 10 km W of Babazaid between Malavi and Pol-e Dohtar, 880 m, 9-10 iv 1977, 1ex, exp. Nat. Mus., V. Kalik det., NMPC, Iran, Kohgiluyeh, route de Charam, 22 v.1974, 2ex, A. Senglet lgt., V. Kalik det., MHNG, Iran, Fars, Dishopour, 28 v 1974, 1ex, A. Senglet lgt., V. Kalik det., MHNG, Iran, Khuzestan, Masjed Soleyman, 20 v 1974, 1ex, A. Senglet lgt., V. Kalik det., MHNG.

**DISTRIBUTION:** The species distributed in the Mediterranean (Lepesme 1946, Mroczkowski 1968, Zhantiev 1976, Lafer 1992). First record from Iran.



Figs 10-18 Figs 10, 13, 16 - ventral view of abdomen 10 - *Dermestes (D) kaffai* sp. n., 13 - *D. (D) elegans* Gebler, 16 - *D. (D) solskyi* Dalla Torre Figs 11, 14, 17 - dorsal view of elytra 11 - *Dermestes (D) kaffai* sp. n., 14 - *D. (D) elegans* Gebler, 17 - *D. (D) solskyi* Dalla Torre Figs 12, 15, 18 - male genitalia lateral view of one paramere and median lobe 12 - *Dermestes (D) kaffai* sp. n., 15 - *D. (D) elegans* Gebler, 18 - *D. (D) solskyi* Dalla Torre.

***Dermestes (Dermestinus) sibiricus* Erichson, 1846**

MATERIAL EXAMINED: N Iran, Chalus Karaj, Marzan Abad, 3000 m, 18 vi 1997, 2ex, M. Káňa lgt., J. Háva det., JHAC; S Iran, Zagros Mts., Boyerahmad-va-Kuhgiluyeh pr., Kuh-e-Dinar ridge, 10 km NE of Yasuj, 1800–2500 m, 1–2 v 1996, 1ex, D. Král lgt., J. Háva det., JHAC; C Iran, 30 km S of Robat-e Tork, Esfahan Prov., 24–25 vi 1973, 14ex, exp. Nat. Mus., V. Kalík det., NMPC; Iran, 30 km S of Robat-e Tork, 24 vi 1973, 1ex, V. Kalík det., SMNS.

DISTRIBUTION. Species known from Caucasus, Turkey, Middle Asia, Kazakhstan, Uzbekistan, Turkmenistan, Siberia, northern China and Mongolia (Lepesme 1946, Mroczkowski 1968, Zhantiev 1976, Lafer 1992). First record from Iran.

***Dermestes (Dermestinus) solskyi* Dalla Torre, 1911**

(Figs 16–18)

*Dermestes rarus* Solsky, 1876: 269 nec *D. rarus* LeConte, 1854: 108.

TYPE MATERIAL EXAMINED. Holotype by present designation, labelled *Dermestes rarus mihi* // *Shachtruda Petata* // G. Kristophorn kol. Solskovo // ZMAS.

ORIGINAL DESCRIPTION. “*Dermestes rarus mihi* (female): elongato-ovalis, cylindricus, niger, subopacus, subtilissime ruguloso-punctulatus, capite, thorace elytrisque basi late fulvo-cinereo, maculaum tomentosus, elytris pone basin nigro-pubescentibus. Scutello albotomentoso. Antennis piceis, clava ferruginea. Subtus dense albo-tomentosus, abdomine lateribus nigro-maculato, segmento ultimo toto nigro, fulvo-cinereo pubescente, coxis trochanteribusque albis. Long. 7 (elytr. 5), lat. 3 mm.”

REDESCRIPTION. Male. Body black, oval, convex. Body length 7 mm. Body width 3 mm. Cuticle black, colouring of body surface by dense, coloured pubescence. Head with yellow hairs, antenna reddish brown, with eleven segments, antennal club from three last segments. Pronotum yellow-orange with intermixed black hairs, punctured more closely. Scutellum triangular, with white long pubescence. Elytra with wide yellow basal transverse band, each elytron without black spot near scutellum; posterior part of elytrae uniformly black (Fig. 17). Legs reddish brown with yellow pubescence. Ventral part of body densely covered with white and black pubescence. Abdominal sternites with exception of the last one (Fig. 16) white, each with clearly delimited triangular black spot laterally and with two small black spots posteriorly. Sternite IV medially each without a group of erected white setae, oriented posteriad. Last sternite black without small white spots on anterior margin and with long, yellow hairs on posterior margin. Aedeagus as in (Fig. 18).

Female unknown.

DIFFERENTIAL DIAGNOSIS. *Dermestes* (*D.*) *solskyi* is habitually very similar to *D.* (*D.*) *elegans* and *D.* (*D.*) *kafkai* sp. n. Main morphological differences are shown in the table of the *D.* (*D.*) *kafkai* sp. n. REMARKS. Species known only from the holotype (Dalla Torre 1911, Lepesme 1946, Mroczkowski 1968).

***Dermestes (Dermestinus) undulatus* Brahm, 1790**

MATERIAL EXAMINED: S Iran, Zagros Mts., Boyerahmad-va-Kuhgiluyeh pr., Kuh-e-Dinar ridge, 10 km NE of Yasuj, 1–2 v 1996, 21ex, D. Král lgt., J. Háva det., JHAC; NW Iran, Azarbaijan, Kivi Bala, 21 km W of Khalkhal 1500 m, 16 viii 1970, 5ex, exp. Nat. Mus., V. Kalík det., NMPC; C Iran, p. Fars, Yasug NV, Siraz (vill. Kakan), 3040N 5143E, 13 vi 1999, 1ex, P. Kabátek lgt., J. Háva det., JHAC.

DISTRIBUTION. The species distributed in Holarctic region, from Iran without detailed data reported by Lepesme (1946), Mroczkowski (1968), Zhantiev (1976), and Lafer (1992).



Table 1. Species of *Dermestes* listed from Iran (following abbreviations used: D – Dalla Torre, L – Lafer, M – Mroczkowski, S – Sokolov, Z – Zhaniev, HK – this paper)

species	reference (s)
<i>Dermestes (Dermestinus) coronatus</i> Steven, 1808	S 1972, HK
<i>Dermestes (Dermestinus) fruschi</i> Kugelan, 1792	HK
<i>Dermestes (Dermestinus) gyllenhali gyllenhali</i> Castelnau, 1840	M 1968
<i>Dermestes (Dermestinus) intermedius iranicus</i> ssp. n.	HK
<i>Dermestes (Dermestinus) kaffai</i> sp. n.	HK
<i>Dermestes (Dermestinus) kaszabi</i> Kalik, 1951	HK
<i>Dermestes (Dermestinus) maculatus</i> DeGeer, 1774	HK
<i>Dermestes (Dermestinus) murinus murinus</i> Linnaeus, 1758	HK
<i>Dermestes (Dermestinus) sardous sardous</i> Kuster, 1846	HK
<i>Dermestes (Dermestinus) sibiricus</i> Erichson, 1846	HK
<i>Dermestes (Dermestinus) solskyi</i> Dalla Torre, 1911	D 1911, M 1968, Z 1976, L 1992, HK
<i>Dermestes (Dermestinus) undulatus undulatus</i> Bruhns, 1790	M 1968, Z 1976, L 1992, HK
<i>Dermestes (Dermestes) ater</i> DeGeer, 1774	M 1968, Z 1976, HK
<i>Dermestes (Dermestes) bicolor</i> Fabricius, 1781	HK
<i>Dermestes (Dermestes) fuliginosus</i> Rossi, 1792	HK
<i>Dermestes (Dermestes) lardarius</i> Linnaeus, 1758	HK
<i>Dermestes (Dermestes) leechi</i> Kalik, 1952	HK
<i>Dermestes (Dermestes) olivieri</i> Lepesme, 1946	Z 1976, L 1992, HK

#### *Dermestes (Dermestes) ater* DeGeer, 1774

MATERIAL EXAMINED: SE Iran, Baluchistan, Chabahar env., 10 xi 1995, 1 ex. on the dead *Caretta* sp., M. Kalika lgt., J. Hava det., JHAC; S Iran, Hormozgan, Bagh-e Tang, 6 km W of Genu, 410 m, 7–9 v 1977, 1 ex, exp. Nat. Mus., V. Kalik det., NMPC.

DISTRIBUTION: Cosmopolitan species, from Iran without detailed data reported by Mroczkowski (1968), Zhaniev (1976).

#### *Dermestes (Dermestes) bicolor* Fabricius, 1781

MATERIAL EXAMINED: SE Iran, Baluchistan, Tas, 6–7 iv 1973, 1 ex, exp. Nat. Mus., V. Kalik det., NMPC; Iran, Mordab, 28 x 1954, 1 ex, F. Schanffolo lgt., V. Kalik det., SMNS; Iran, Baluchistan, Iranshar, 800 m, 11–18 iii 1954, 1 ex, Richter & Schanffolo lgt., V. Kalik det., SMNS; Iran, Golhak bei Teheran, 1400 m, vi–viii 1961, 1 ex, J. Klapperich lgt., V. Kalik det., FHNM.

DISTRIBUTION: The species distributed in the Palaearctic region (Lepesme 1946, Mroczkowski 1968, Zhaniev 1976, Lafer 1992). First record from Iran.

#### *Dermestes (Dermestes) fuliginosus* Rossi, 1792

MATERIAL EXAMINED: Iran, Dekendera, 2300 m, 24.4.1970, 1 ex, Wittmer & Boethmer lgt., V. Kalik det., NHMB.

DISTRIBUTION: Species distributed in central and southern Europe, Turkey and Caucasus (Lepesme 1946, Mroczkowski 1968, Zhaniev 1976, Lafer 1992). First record from Iran.

#### *Dermestes (Dermestes) lardarius* Linnaeus, 1758

MATERIAL EXAMINED: N Iran, Tehran env., 26 vi 1996, 1 ex, J. Hava det., JHAC; N Iran, Khwoy, vi. 1902, 1 ex, C. & O. Vogt lgt., V. Kalik det., VKAC.

**DISTRIBUTION** Cosmopolitan species (Lepesme 1946, Mroczkowski 1968, Zhantiev 1976, Lafer 1992)  
First record from Iran

***Dermestes (Dermestes) leechi* Kalík, 1952**

**MATERIAL EXAMINED** Persien, Sisian, 10 iv 1950, 2ex, coll. Scharif, V. Kalík det., NHMB

**DISTRIBUTION** Species known from India, Turkmenistan, Uzbekistan, Pakistan, Tadzhikistan, Morocco, Egypt, Sebair Isl., W of Hodeida in the S Red Sea, Spain, Sudan (Adams 1980, Hava 1999) First record from Iran

***Dermestes (Dermestes) olivieri* Lepesme, 1939**

**MATERIAL EXAMINED** N Iran, Chalus Karaj, Marzan Abad, 2000 m, 18 vi 1997, 4ex. M. Kafka lgt., J. Hava det., JHAC, MKAC. Iran, Azarbaygan, Kalli, Arasbaran, 2400–2650 m, 25 v 1978, 2ex, Martens & Pieper lgt., J. Hava det., SMNS. Iran, Ala-Dagh, Budschnurd, 1033 m, v 1902, 2ex, coll. Hausen, J. Hava det., NMPC

**DISTRIBUTION** The species distributed in southern and Central Europe, Caucasus, Turkey, Turkmenistan and Syria, from Iran reported by Lepesme (1946), Mroczkowski (1968), Zhantiev (1976), Lafer (1992)

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## Classification of the *Amara (Amara) communis* species aggregate based on the egg and larval stage characters (Coleoptera: Carabidae: Amarina)

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**Abstract.** The superficial chorion structure and three larval instars of *Amara (Amara) communis* (Panzer, 1797), *A. (A.) convexior* Stephens, 1828, *A. (A.) makolisku* Roubal, 1923 and *A. (A.) pulpani* Kult, 1949 reared ex ovo are described and illustrated. Differential diagnosis of the *A. communis* species aggregate, based on larval characters, is given. The keys to the species of the *A. communis* species aggregate are provided, separately for the first instar larvae, and for the second+third instar larvae. The specific status of all four mentioned species is corroborated. *A. convexior* and *A. pulpani* are considered more derived. *A. communis* and *A. makolisku* are closely related.

**Taxonomy, larval taxonomy, classification, keys, egg chorion structure, Coleoptera, Carabidae, *Amara communis* species aggregate, *A. convexior*, *A. makolisku*, *A. pulpani*, Palaearctic Region**

### INTRODUCTION

In the adult stage the *Amara (Amara) communis* species aggregate is characterized by the combination of the following features: scutellar stria present, scutellar setiferous puncture absent, setiferous puncture at pronotal posterior angle well removed from lateral head, separated from it by distance at least equal to width of setiferous puncture; elytral striae deepened and widened apically, usually entire antennomere 2 or at least its two thirds dorsally pale red-brown, antennomere 3 to great extent pale red-brown (Hůrka 1996). The aggregate consists of four species: *A. communis* (Panzer, 1797), *A. convexior* Stephens, 1828, *A. makolisku* Roubal, 1923 (= *A. pseudocommunis* Burakowski, 1957) and *A. pulpani* Kult, 1949. The specific status of *A. convexior* has been acknowledged since a long time. The differentiation of all four species in the adult stage was provided by e.g. Gersdorf & Kuntze (1957) and by Hůrka (1996).

The aim of this paper is (1) to found specific differential characters also in the preimaginal stages, and (2) to determine the differential diagnosis of the *A. communis* species aggregate in the larval stage. The differential diagnosis of the subgenus *Amara* Bonelli in the larval stage was published by Hůrka (1998). Scanty structural characters and morphometric data on larvae of *A. communis* and *A. convexior* were given by Arndt (1991) and Luff (1993). Burakowski (1967) provided some data on morphology and bionomy of the preimaginal stages of *A. makolisku*. In the paper by Luff (1981) some metric features of the *A. communis* egg are given.

### MATERIAL AND METHODS

All four species are reared in the laboratory conditions according to the technique described by Hůrka (1996). The material of eggs (E) and of all three larval instars (L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub>), reared ex ovo, are available for taxonomic study: *A. communis* – 2 E, 12 L<sub>1</sub>, 8 L<sub>2</sub>, 17 L<sub>3</sub>; *A. convexior* – 3 E, 8 L<sub>1</sub>, 6 L<sub>2</sub>, 10 L<sub>3</sub>; *A. makolisku* – 1 E, 3 L<sub>1</sub>, 2 L<sub>2</sub>, 3 L<sub>3</sub>; *A.*

*pulpani* – 3 E, 7 L<sub>1</sub>, 11 L<sub>2</sub>, 17 L<sub>3</sub>. The parental pairs are found as follows: *A. communis* – Slovakia or, Latorica River, Bol (code of mapping square 7596<sup>1</sup>), flood debris, 11 iv 1987, J. Růžicka & A. Růžickova leg.; Bohemia border, Vrchlabí (5359), 20 iv 1997, P. Šaska leg.; *A. convexior* – Bohemia centr., Nové Mlýny pr. Vlašim (6255), 30. iii 1986, Bohemia centr., Praha-Haje (5952), 16 iv 1986, J. Růžicka leg.; Bohemia centr., Praha-Troja, Havránek (5852), 23 iv 1993, Bohemia centr., Praha-Čimice (5852), 27 iv 1996, 19 iv 1997, K. Hárka leg.; *A. makolskii* – Bohemia occ., peat bog Souds (5840), 14 iv 1987, J. Hejkal leg.; *A. pulpani* – Bohemia occ., Kraslice, Tisovec (5641), heath, 2 iv 1987, 19 iv 1990, J. Hejkal leg.; Bohemia occ., Kraslice, Šibení vrch (5641), heath, 16 v 1989, 23 iv 1995, J. Hejkal leg.

For comparative purpose larvae of ten other species of the nominotypical subgenus *Amara* Bonelli, 1810, *A. (Amara) erratica* (Duftschmid, 1812), six species of the subgenus *Celia* Zimmermann, 1832, *A. (Paracelia) quenekei quenekei* (Schönherr, 1806), *A. (Percastus) equestris equestris* (Duftschmid, 1812), five species of the subgenus *Brachinus* Stephens, 1823 and three species of the subgenus *Curtonotus* Stephens, 1828 have been studied. All larvae are deposited in the Collectio Hárka, Department of Zoology, Charles University Praha.

The notation of setae and pores follows the papers by Bousquet & Goulet (1984) and Bousquet (1985).

Micrographs were obtained using a Tesla BS 500 model scanning electron microscope.

## DESCRIPTIONS

### *Amara (Amara) communis* (Panzer, 1797)

(Figs 1, 2, 9–19)

**COLOUR.** Head yellow-brown, thoracic and abdominal terga yellow-brown to brown-gray.

**EGG.** Chorion structure with almost round pores, without marginal projections (Figs 1, 2).

**LARVAL STAGE: THIRD INSTAR.** Head: cephalic capsule transverse (index width/length = 1.45–1.56), sides slightly convex; cervical grooves distinct, reaching space between PA<sub>3</sub> and PA<sub>5</sub> dorsally and almost reaching PA<sub>4</sub> ventrally; coronal suture nearly as long as the length of antennomere IV (0.92–1.08, aver. 0.98, n=17), nasale with six large, nearly equally spaced teeth (Figs 14, 15); mandibles with one longer and 0–2 small secondary setae, antennomere I with one slight secondary seta, labial palpomere I without secondary seta; width of head capsule 1.15–1.30 (aver. 1.21, n=17) mm (Arndt 1991: 0.95–1.11 mm). Thorax: femora with 4–7 spiniform secondary setae. Abdomen: terga I–IV in anterior row with distinct setae TE<sub>1</sub>, TE<sub>6</sub>, TE<sub>7</sub>, in posterior row with long seta TE<sub>9</sub> and TE<sub>10</sub>, TE<sub>8</sub> slight (Fig. 18), urogomphi slightly longer than width of tergum IX (1.05–1.25, aver. 1.15), with four strong secondary setae, UR<sub>6</sub> absent, UR<sub>7</sub> at most half as long as UR<sub>5</sub> (aver. 0.38, n=15) (Fig. 19). **SECOND INSTAR.** Head: index width/length = 1.43–1.54; coronal suture as long as about three fourth to four fifths of the length of antennomere IV (0.70–0.90, aver. 0.77, n=7); antennomere I without secondary seta, antennomere II with only one secondary seta; width of head capsule 0.80–1.00 (aver. 0.92, n=8) mm (Arndt 1991: 0.71–0.74 mm). Thorax: femora with 4–5 spiniform secondary setae.

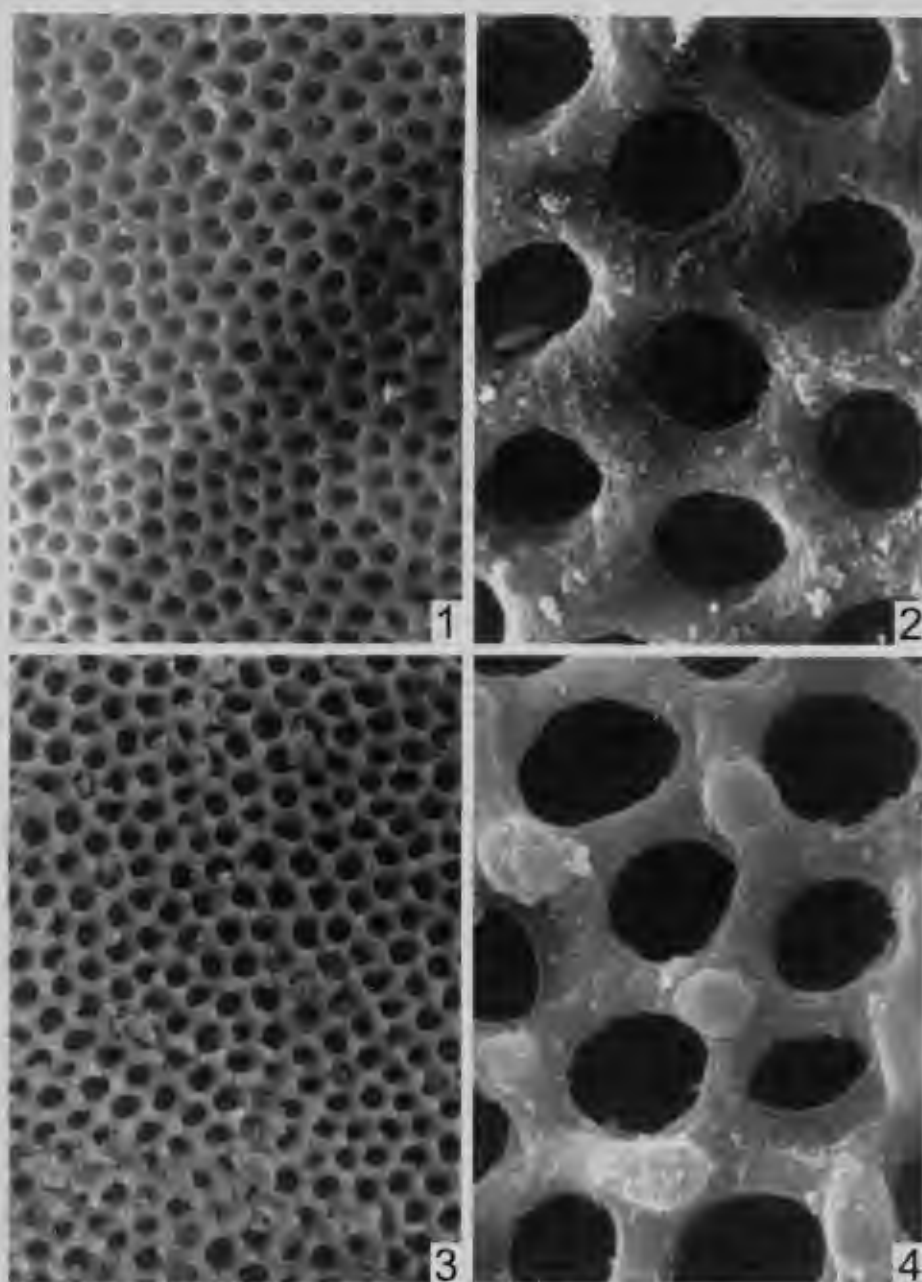
**FIRST INSTAR.** Head: index width/length = 1.32–1.50; egg burster forming a ridge composed of very small, blunt teeth, more spaced proximad, reaching base of FR<sub>1</sub>, PA<sub>4</sub> petty (Fig. 9); coronal suture as long as two thirds or three fourth of antennomere IV length (0.67–0.75), width of head capsule 0.68–0.74 (aver. 0.71, n=12) mm (Arndt 1991: 0.51–0.54 mm). Abdomen: tergal setae of the posterior row (TE<sub>9</sub>, TE<sub>10</sub>) at least six times as long as setae of the anterior row (TE<sub>7</sub>) (Fig. 17), urogomphi 1.20–1.45 times as long as width of tergum IX.

### *Amara (Amara) makolskii* Roubal, 1923

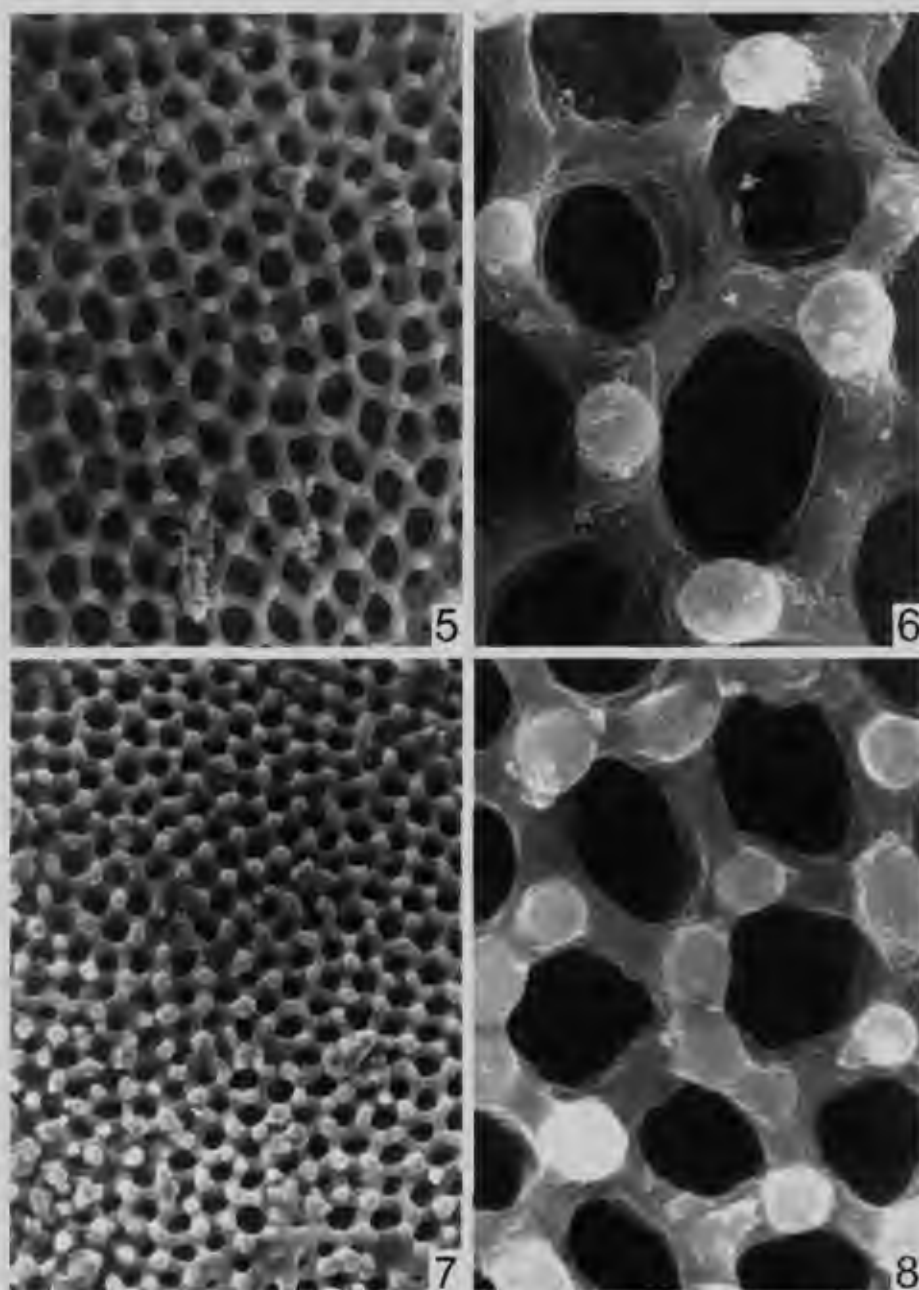
(Figs 3, 4, 20–29)

**COLOUR.** Head yellow-brown, thoracic and abdominal terga yellow-brown to brown-gray.

<sup>1</sup> for details see Buchar (1982)



Figs 1–4. Scanning electron micrographs of the superficial chorion structure: 1 (2700 $\times$ ), 2 (13500 $\times$ ): *Amara (A.) communis* (Punzer) (Slovakia on Istara River, Bof), 3 (2700 $\times$ ), 4 (13500 $\times$ ): *A. (A.) makolskii* Roubal (Bohemian rep., Štoss).



Figs 5-8. Scanning electron micrographs of the superficial chorion structure. 5 (2700 $\times$ ), 6 (13500 $\times$ ): *Antara* (A.) *convexior* Stephens (Bohemia: cent. Praha-Haje). 7(2700 $\times$ ), 8 (13500 $\times$ ): *A. (A.) nulpura* Kolt (Bohemia: o.p.c., Ráslíec).



EGG. Pores of the chorion structure slightly oval with two to three marginal projections (Figs 3, 4). LARVAL STAGE. THIRD INSTAR. Head: cephalic capsule transverse (index width/length = 1.40–1.45), sides only slightly convex; cervical grooves distinct, reaching space between  $PA_2$  and  $PA_3$  dorsally and almost reaching  $PA_4$  ventrally; coronal suture as long as about two thirds of the length of antennomere IV (0.67–0.73); nasale with six large teeth, the inner and the outer teeth slightly more spaced (Fig. 25); mandibles with one longer and 1–2 small secondary setae; antennomere I with one slight secondary seta, antennomere II with 1–2 secondary setae, labial palpomere I without secondary seta, width of head capsule in three specimens: 1.14, 1.14, 1.15 mm (Burakowski 1967: 1.13–1.30 mm). Thorax: femora with 4–8 spiniform secondary setae. Abdomen: terga I–IV with setae  $TE_{1,6,7}$  distinct, setae  $TE_{9,10}$  long, seta  $TE_{10}$  at least three times as long as seta  $TE_7$ ,  $TE_8$  slight or absent (Fig. 28); urogomphi nearly as long as width of tergum IX, with four strong secondary setae,  $UR_8$  absent,  $UR_9$  of about two thirds to three fourth of  $UR_7$  length (aver. 0.64,  $n=6$ ).

SECOND INSTAR. Head: index width/length = 1.47; coronal suture as long as about two thirds of antennomere IV length; antennomere I without secondary seta, antennomere II with one secondary seta; width of head capsule 0.91 and 0.96 mm (Burakowski 1967: 0.85–0.95 mm). Thorax: femora with 4–5 spiniform setae. Abdomen: urogomphi slightly longer than width of tergum IX.

FIRST INSTAR. Head: index width/length = 1.40; egg burster forming a ridge composed of very small, blunt teeth, more spaced proximad, reaching over the base of  $FR_2$ ,  $PA_4$  petty (Fig. 20); coronal suture nearly half as long as length of antennomere IV (0.45–0.50), width of head capsule 0.69, 0.71, 0.72 mm (Burakowski 1967: 0.62–0.75). Abdomen: tergal setae of the posterior row ( $TE_{9,10}$ ) at least five times as long as setae of the anterior row ( $TE_7$ ) (Fig. 27); urogomphi 1.20–1.40 times as long as width of tergum IX.

#### *Amara (Amara) convexior* Stephens, 1828

(Figs 5, 6, 30–39)

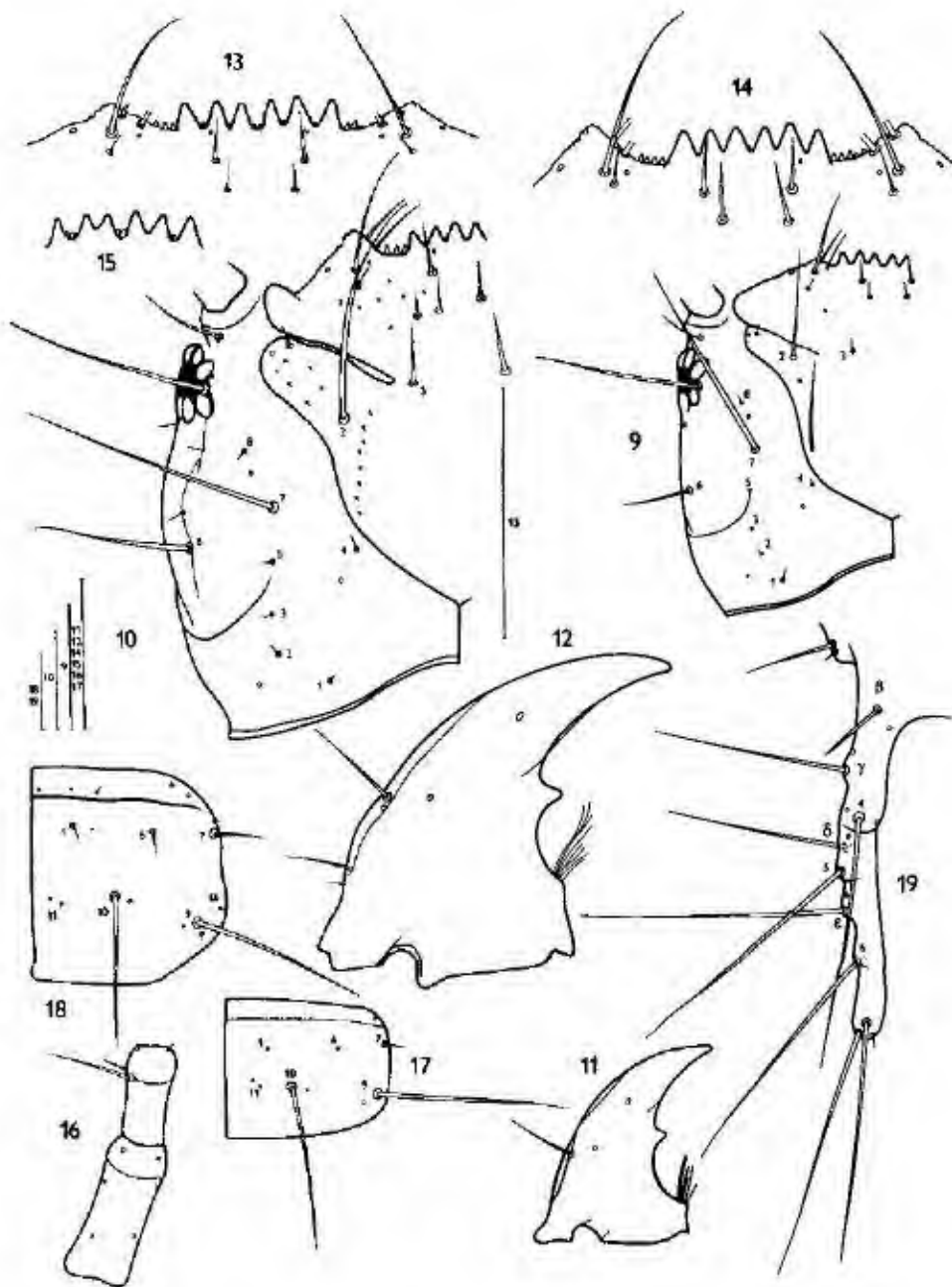
COLOUR. Head, thoracic and abdominal terga yellow-brown, in first instar terga pale brown.

EGG. Pores of the chorion structure oval, large, with three to four marginal projections (Figs 5, 6).

LARVAL STAGE. THIRD INSTAR. Head: cephalic capsule transverse (index width/length = 1.40–1.50), sides slightly convex; cervical grooves distinct, reaching almost seta  $PA_2$  dorsally and  $PA_4$  ventrally; coronal suture about as long as length of antennomere IV (0.90–1.0, aver. 0.95,  $n=8$ ); nasale with six large, nearly equally spaced teeth (sometimes greater space in middle) (Fig. 35); mandibles mostly only with one longer secondary seta; antennomere I with one slight inner secondary seta, antennomere II with regularly 2 secondary setae, labial palpomere I without secondary seta; width of head capsule 1.34–1.50 mm (aver. 1.44,  $n=10$ ). Thorax: femora with 4–8 spiniform secondary setae. Abdomen: terga I–IV with setae  $TE_{6,7}$  distinct, setae  $TE_{9,10}$  long, seta  $TE_{10}$  at least three times as long as seta  $TE_7$ ,  $TE_8$  slight or absent (Fig. 38); urogomphi slightly longer (1.1–1.2 times) than width of tergum IX, in-curved apicad, with three strong secondary setae,  $UR_8$  and  $UR_9$  absent (Fig. 39).

SECOND INSTAR. Head: index width/length = 1.40–1.45; coronal suture as long as two thirds to three fourth of length of antennomere IV; antennomere I without secondary seta, antennomere II with one secondary seta; width of head capsule 1.03–1.12 (aver. 1.08,  $n=6$ ) mm. Thorax: femora with 4–5 spiniform secondary setae. Abdomen: tergal seta  $TE_{10}$  at least four times as long as seta  $TE_7$ ; urogomphi 1.2–1.3 times as long as width of tergum IX.

FIRST INSTAR. Head: index width/length = 1.30–1.40; egg burster forming a ridge composed of very small, blunt teeth, more spaced proximad, reaching the base of  $FR_2$ ,  $PA_4$  petty (Fig. 30); coronal suture as long as two thirds of the length of antennomere IV (0.66–0.70), width of head capsule



Figs 9-19. *Amora (A.) communis* (Panzer). 9, 10: cephalic capsule of  $L_1$ ,  $L_3$ ; 11, 12: mandible of  $L_4$ ,  $L_5$ ; 13: nasale of  $L_1$ ; 14, 15: nasale of  $L_3$ ; 16: antennomeres I-II of  $L_3$ ; 17, 18: abdominal tergum IV of  $L_1$ ,  $L_3$ ; 19: tergum IX and urogomphus of  $L_3$ . Scales = 0.2 mm.

0.78–0.84 (aver 0.81, n=8) mm (Arndt 1991: 0.75–0.85 mm) Abdomen: tergal setae of the posterior row ( $TE_{9,10}$ ) at least six times as long as setae of the anterior row ( $TE_7$ ) (Fig. 37), urogomphi 1.20–1.40 times as long as width of tergum IX.

***Amara (Amara) pulpani* Kult, 1949**  
(Figs 7, 8, 40–49)

**COLOUR** Head yellow-brown, thoracic and abdominal terga yellow brown to brown-gray.

**EGG** chorion structure with angular (pentagonal) pores with mostly five marginal projections (Figs 7, 8).

**LARVAL STAGE** Third instar. **Head**: cephalic capsule transverse (index width/length = 1.31–1.35), sides slightly convex, cervical grooves distinct, reaching space between  $PA_3$  and  $PA_4$  dorsally and almost reaching  $PA_{4,5}$  ventrally, coronal suture as long as two thirds of length of antennomere IV, nasale with six large, nearly equally spaced teeth (Fig. 45), mandibles with one longer and 0–1 small secondary setae (Fig. 43), antennomere I without secondary seta, antennomere II with one secondary seta (very rarely with two setae, then antennomere I with one small secondary seta), labial palpomere I without secondary seta, width of head capsule 1.17–1.36 (aver 1.27, n=17) mm. **Thorax**: femora with 4–7 spiniform secondary setae. **Abdomen**: terga I–IV with only three distinct setae  $TE_{7,9,10}$ ,  $TE_6$  imperceptible (Fig. 48), urogomphi nearly as long as width of tergum IX (0.86–1.04, aver 0.96), with only one secondary seta  $UR_6$  (only six long setae present) (Fig. 49).

**SECOND INSTAR** Head: index width/length = 1.27–1.31, width of head capsule 0.99–1.06 (aver 1.03, n=11) mm. **Thorax**: femora with 4–6 spiniform secondary setae.

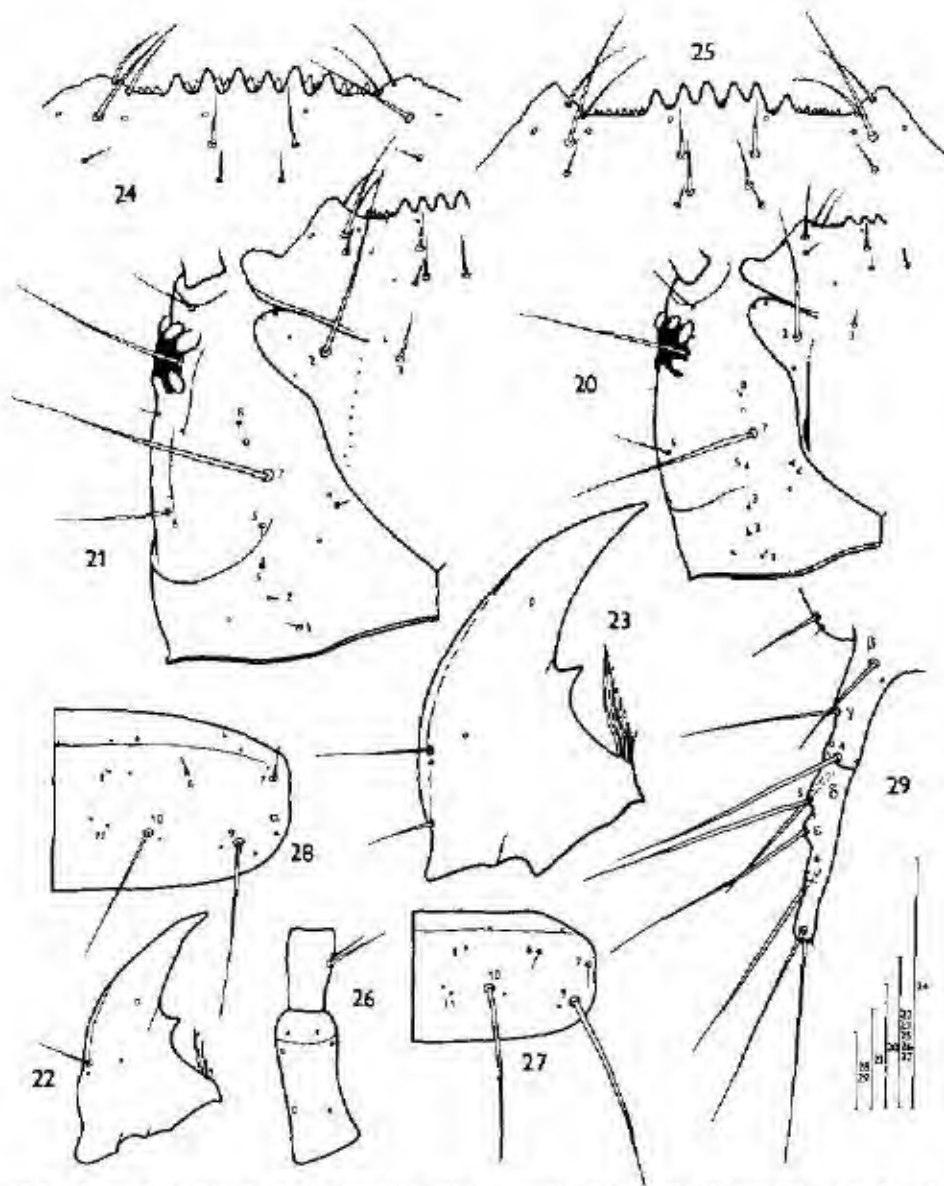
**FIRST INSTAR** Head: index width/length = 1.23–1.28, egg bursters forming a ridge composed of very small, blunt teeth, more spaced proximad, reaching over  $FR_2$ ,  $PA_4$  imperceptible (Fig. 42), coronal suture half as long as length of antennomere IV, width of head capsule 0.76–0.82 (aver 0.78, n=7) mm. **Abdomen**: tergal setae of the posterior row ( $TE_{9,10}$ ) at least eight times as long as setae of the anterior row ( $TE_7$ ) (Fig. 47), urogomphi 1.15–1.25 times as long as width of tergum IX.

**Key to the first instar larvae**

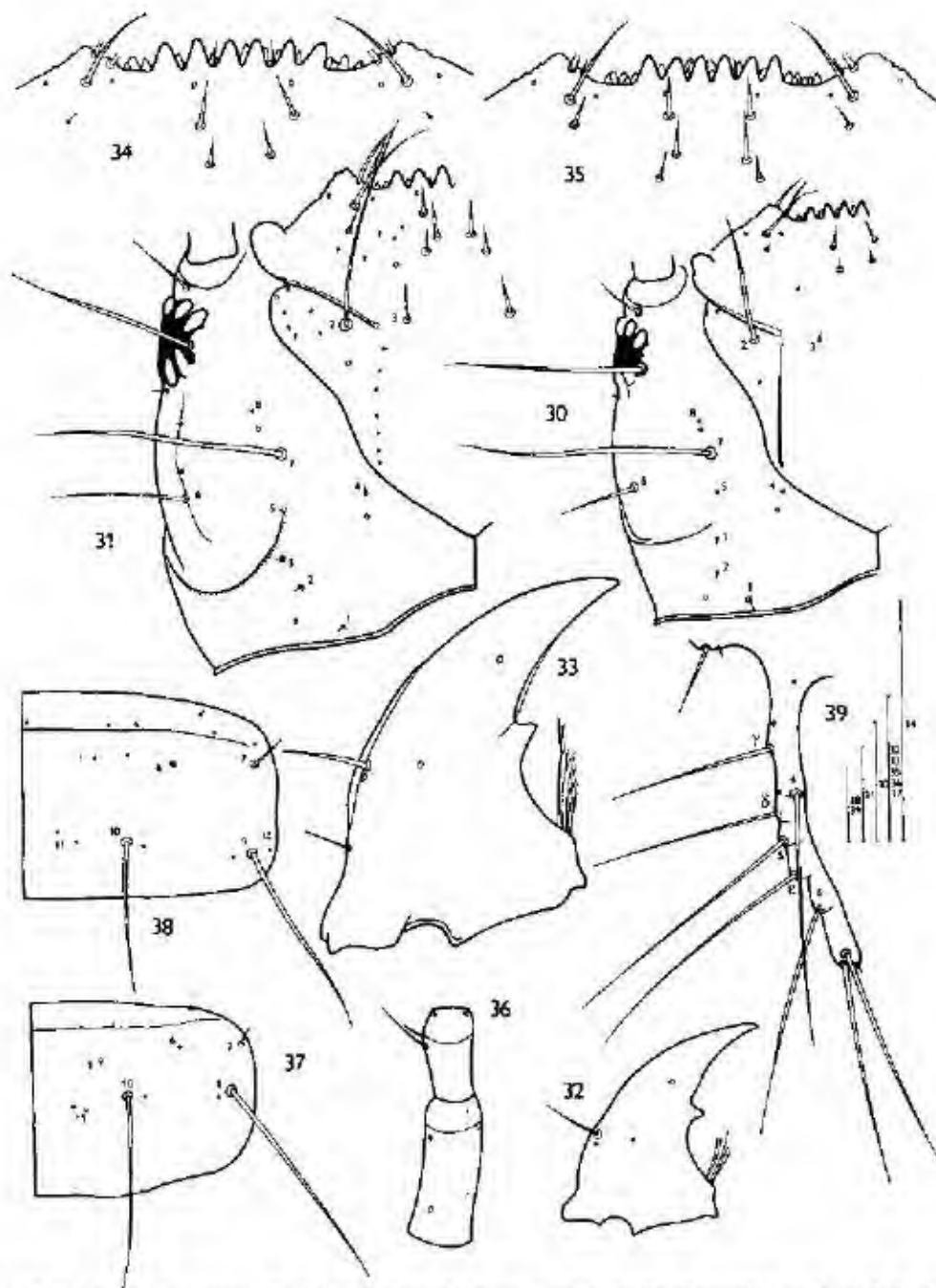
- 1 (2) Setae  $PA_4$ ,  $PA_5$  on parietale and  $TE_6$  on abdominal tergum IV scarcely perceptible, seta  $PA_6$  as long as one half to two fifths of length of  $PA_7$  (Fig. 47) *A. pulpani* Kult
- 2 (1) Setae  $PA_4$ ,  $PA_5$  on parietale and  $TE_6$  on abdominal tergum IV small, but distinct, seta  $PA_6$  as long as two fifths to one fourth of  $PA_7$  length (Figs 17, 27, 37) *A. convexator* Stephens
- 3 (4) Seta  $PA_4$  about twice as long as seta  $FR_3$  (Fig. 30) *A. makolskii* Roubal
- 4 (3) Seta  $PA_4$  nearly as long as seta  $FR_3$  (Figs 9, 26) *A. communis* (Panzer)
- 5 (6) Coronal suture short, at most half as long as length of antennomere IV
- 6 (5) Coronal suture longer, at least as long as two thirds of antennomere IV length

**Key to the second and third instar larvae**

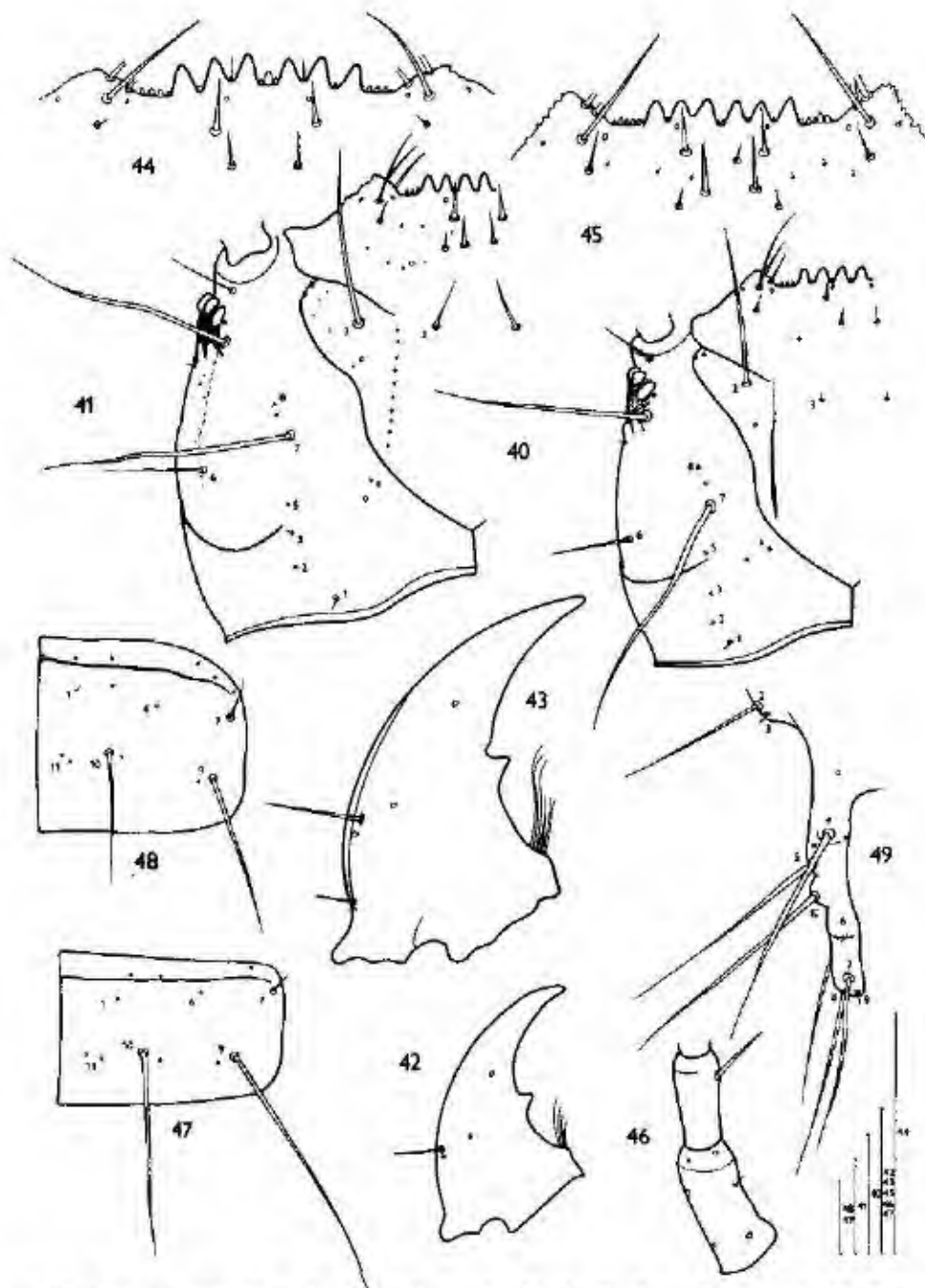
- 1 (2) Urogomphi with 6 strong setae (Fig. 49), abdominal tergum IV with three distinct setae:  $TE_{1,2,3}$  and  $TE_{4,5}$  and  $PA_{4,5}$  scarcely perceptible (Fig. 48), antennomere II regularly with one secondary seta in both instars  $L_2$  and  $L_3$  *A. pulpani* Kult
- 2 (1) Urogomphi with 8–9 strong setae (Figs 19, 29, 39), setae  $TE_{1,2,3}$  and  $PA_{4,5}$  small, but distinct, antennomere II regularly with two secondary setae in  $L_2$  and one seta in  $L_3$  *A. convexator* Stephens
- 3 (4) Urogomphi with 8 strong setae (Fig. 39), seta  $PA_3$  about half as long as setae  $PA_2$ ,  $PA_1$  (Fig. 31)
- 4 (3) Urogomphi with 9 strong setae (Figs 19, 29), seta  $PA_3$  nearly as long as setae  $PA_2$ ,  $PA_1$  (Figs 10, 21)



Figs 20-29. *Amara (A.) makolsku* Roubal. 20, 21: cephalic capsule of L., U. 22, 23: mandible of L., L<sub>1</sub>. 24, 25: nasale of L., L<sub>1</sub>. 26: antennomeres I+II of L<sub>1</sub>. 27, 28: abdominal tergum IV of L., L<sub>1</sub>. 29: tergum IX and urogomphus of L<sub>1</sub>. Scales = 0.2 mm.



Figs 30-39. *Amara (A.) convexior* Stephelis. 30, 31: cephalic capsule of LII, LI; 32, 33: mandibles of LII, L-3; 34, 35: nasale of LII, L-; 36: antennomeres I+II of L-; 37, 38: abdominal tergum IV of LII, L-; 39: tergum IX and urogomphus of LI. Scales = 0.2 mm.



Figs 40-49. *Amara (A.) pulpari* Kult. 40, 41: cephalic capsule of  $L_1$ ,  $L_2$ , 42, 43: mandible of  $L_1$ ,  $L_2$ , 44, 45: nasale of  $L_1$ ,  $L_2$ , 46: antennomeres I+II of  $L_1$ , 47, 48: abdominal tergum IV of  $L_2$ ,  $L_1$ , 49: tergum IX and urogomphus of  $L_1$ . Scales = 0.2 mm.



- 5 (6) Coronal suture longer, ratio length of coronal suture/length of antennomere IV in  $L_2$  0.70–0.90, in  $L_3$  0.90–1.10; urogomphi with seta  $UR_6$  regularly at most half as long as seta  $UR_7$  (Fig. 19) *A. communis* (Panzer)
- 6 (5) Coronal suture shorter, ratio length of coronal suture/length of antennomere IV in both instars  $L_2$  and  $L_3$  0.70–0.75; urogomphi with seta  $UR_6$  regularly at least as long as two thirds of length of seta  $UR_7$  (Fig. 29) *A. makoliski* Roubal

#### Differential diagnosis of the *Amara communis* species aggregate in the larval stage

Seta  $PA_4$  very short, at most as long as seta  $PA_3$ . Setae in the anterior row of abdominal terga short or indistinct (especially  $TE_1$ ,  $TE_6$ ), setae  $TE_9$ ,  $TE_{10}$  in the posterior row long, seta  $TE_4$  absent or very short, at most one tenth of length of seta  $TE_{10}$ ; urogomphi with 6–9 strong setae, seta  $UR_6$  absent.

Both imaginal and larval features clearly define the *A. communis* species aggregate within the nominotypical subgenus *Amara* Bonelli.

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## New synonymies in the scorpion families Buthidae, Chactidae, and Ischnuridae

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**Abstract.** Revision of types deposited in the Museo Zoologico de "La Specola", Firenze, Italy, shows that *Tityus piceus* Caporiacco, 1947 is a junior synonym of *Tityus cambridgei* Pocock, 1897, *Iomachus borana* Caporiacco, 1939 is a junior synonym of *Iomachus politus* Pocock, 1896, and *Brotochactas magnus* Caporiacco, 1947 (lectotype) is a junior synonym of *Brotochactas granimanus* Pocock, 1898. One syntype of *Brotochactas magnus* is *Brotochactas delicatus* (Karsch, 1879). Lectotype and paralectotypes are designated for *Tityus piceus*, *Brotochactas magnus*, and *Iomachus borana*.

**Taxonomy, new synonymy.** Scorpiones, Buthidae, Chactidae, Ischnuridae

### INTRODUCTION

In the course of identification and revision of scorpions deposited at the Museo Zoologico de "La Specola", Firenze, Italy (MZUF), I found that three species (belonging to three families) hitherto regarded as valid are junior synonyms. Since no work on the pertinent genera is in progress, I decided to propose the new synonymies and designation of lectotypes in this taxonomic note.

The designation of lectotypes and paralectotypes included appending laser-printed labels with species name, author and year of description, notation whether the specimen is being designated lectotype or paralectotype, dsq. F. Kovarik, 1999, and the name of the species into whose synonymy is being placed, including the author and year of description. The information is repeated in lead pencil overleaf.

#### Buthidae Simon, 1879

##### *Tityus cambridgei* Pocock, 1897

*Tityus cambridgei* Pocock, 1897: 360; Kraepelin 1899: 78.  
*Tityus paracensis* Kraepelin, 1896: 129 (syn. by Lourenço 1984: 8).  
*Tityus amazonicus* Giltay, 1928: 79 (syn. by Lourenço 1984: 9).  
*Tityus sampajocruis* Mello-Leitao, 1931: 283 (syn. by Lourenço 1984: 9).  
*Tityus piceus* Caporiacco, 1947a: 20; Caporiacco 1947b: 611; Bartolozzi et al. 1987: 294. **Syn. n.**

**TYPE MATERIAL EXAMINED.** Guyana Britannica, Campo V, XI.1931, 1 female, typus of *Tityus piceus* (hereby designated the lectotype of *Tityus piceus*), leg. N. Beccari; Guyana Britannica, Canister Falls, XI.1931, 1 female, typus of *Tityus piceus* (hereby designated the paralectotype No. 1 of *Tityus piceus*), leg. N. Beccari.

**COMMENTS.** Caporiacco (1947a: 20) described *Tityus piceus* from an unrecorded number of females. In a later paper (Caporiacco 1947b: 611) he mentioned two females. Bartolozzi et al. (1987: 294) stated that two syntypes are deposited at MZUF. I have examined both, and hereby designate them the lectotype and paralectotype No. 1. No other author mentions additional specimens of *T. piceus*.

The original description (Caporiacco 1947a: 20) is not accompanied by a figure and is very brief. It consists of only four lines that do not include any characters differentiating *T. piceus* from *T. cambridgei*. A later description with one figure (Caporiacco 1947b: 611–612) also does not contain characters that would permit distinguishing these two species. Neither my examination of both types has revealed any such characters, and I therefore conclude that *T. piceus* is a junior synonym of *T. cambridgei*, to which it corresponds in all regards.

Chaetidae Pocock, 1893

***Brotheas granimanus* Pocock, 1898**

(Fig. 1)

*Brotheas granimanus* Pocock, 1898: 100; Kraepelin 1899: 171

*Broteochactas magnus* Caporiacco, 1947a: 20; Caporiacco 1947b: 608; Bartolozzi et al. 1987: 294. Syn. n.

TYPE MATERIAL EXAMINED: Guyana Britannica, Campo 2, Sui, Fiume Demerara, XI 1931, 1 female (hereby designated the lectotype), leg. N. Beccari; Guyana Britannica, Campo V, XI 1931, 1 immature male, type of *Broteochactas magnus* (hereby designated the paralectotype No. 1 of *Broteochactas magnus*), leg. N. Beccari

***Broteochactas delicatus* (Karsch, 1879)**

(Fig. 2)

*Chaetax delicatus* Karsch, 1879: 134

*Broteochactas delicatus* Kraepelin, 1894: 177; Kraepelin 1899: 174; Pocock 1900: 68; Caporiacco 1947b: 608

*Brotheas delicatus* Vachon, 1974: 930

*Chaetax opacius* Karsch, 1879: 134 (syn. by Kraepelin 1894: 177).

*Brotheas panamensis* Thorell, 1893: 382; Bartolozzi et al. 1987: 297 (syn. by Kraepelin 1899: 176)

*Broteochactas magnus* (in part) Caporiacco, 1947a: 20; Caporiacco 1947b: 608; Bartolozzi et al. 1987: 294.

MATERIAL EXAMINED: Guyana Britannica, Curupucari, XI 1931, 1 male, type of *Broteochactas magnus*, leg. N. Beccari

COMMENTS. Caporiacco (1947a: 20) described *Broteochactas magnus* from an undisclosed number of specimens. In a later paper (Caporiacco, 1947b: 611) he listed three females. Bartolozzi et al. (1987: 297) stated that three syntypes are deposited at MZUF. I examined all of them and designated the largest specimen as the lectotype. Its length (75 mm) is the only measurement given in Caporiacco's (1947a: 20) description.

The original description (Caporiacco, 1947a: 20) is not accompanied by a figure and is very brief. It consists of only three lines and does not include any characters that would permit to differentiate the lectotype of *B. magnus* from *Brotheas granimanus*. Also a later, more detailed description (Caporiacco, 1947b: 611–612) does not contain characters which unequivocally separate these two species. My examination of the syntypes revealed that they belong to two species of two genera. The lectotype (female, total length 75 mm, 9 pectinal teeth) and paralectotype No. 1 (probably an immature male, total length 60 mm, 10 and 11 pectinal teeth) belong to *Brotheas granimanus* (Fig. 1), whereas the third specimen (a male, total length 53 mm, 8 pectinal teeth) belongs to *Broteochactas delicatus* (Fig. 2).

Ischnuridae Simon, 1879

***Iomachus politus* Pocock, 1896**

*Iomachus politus* Pocock, 1896: 317; Kraepelin 1899: 156

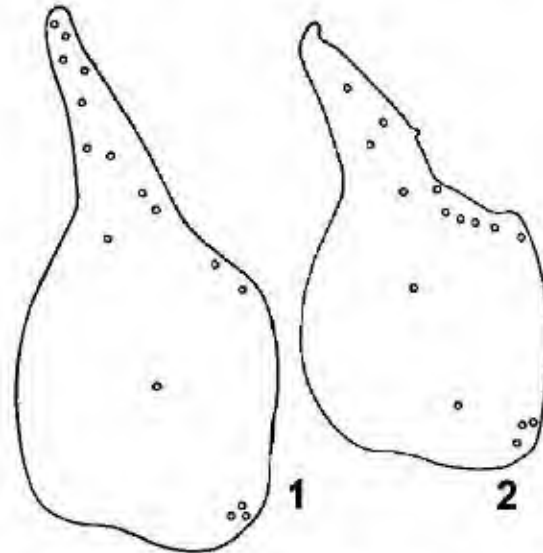
*Iomachus politus* Kraepelin, 1896: 138; Caporiacco 1939: 307; Caporiacco 1949: 314.

*Iomachus borana* Caporiacco, 1939: 307; Moriggi 1941: 96; Bartolozzi et al. 1987: 295. Syn. n.

*Iomachus borana* Sreenivasa-Reddy, 1968: 759; Lamoral & Reynders 1975: 544

TYPE MATERIAL EXAMINED Ethiopia, Borana, Neghelli, 10 III 1937, 2 juvs. type of *Jomachus borana* (hereby designated the lectotype and paralectotype No. 1 of *Jomachus borana*), leg. E. Zavattari

COMMENTS Caporiacco (1939: 307) described *Jomachus borana* from two specimens. They are juveniles of which the larger is 24.3 mm long, and Caporiacco apparently thought it to be an adult female. In the same paper (Caporiacco, 1939: 307) are included two truly adult specimens from the same locality (Neghelli, 29 III 1937), which are identified as *J. politus*. I examined both syntypes of *J. borana* and designate them the lectotype and paralectotype No. 1. I am certain they are juveniles of *J. politus*.



Figs 1–2 *Brotochactas magnus* Caporiacco. Tibia of pedipalps: 1 – lectotype of *Brotochactas magnus* (= *Brotheus granimanus*); 2 – syntype of *Brotochactas magnus* (= *Brotochactas delicatus*).

#### Acknowledgements

I would like to thank Sarah Whitman of the Museo Zoologico de "La Specola", Firenze, Italy, for lending me the types, and Jiří Zidek (Praha, Czech Republic) for translating the text.

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***Palnia cambeforti* sp. n. from Yunnan  
(Coleoptera: Scarabaeidae: Aulonocneminae)**

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**Abstract.** *Palnia cambeforti* sp. n. is described from Yunnan (China) and its diagnostic characters are illustrated. The new species is distinguished from both previously known species by having meso- and metathorax armed with short longitudinal row of very short, remarkably thickened setae distally while meso- and metathorax of *P. loebli* Stebnicka, 1985 and *P. stebnickae* Cambefort, 1989 are unarmed distally.

**Taxonomy.** new species, Coleoptera, Scarabaeidae, Aulonocneminae, Palaearctic region, Oriental region

INTRODUCTION

The 52 presently known species of Aulonocneminae, a small enigmatic subfamily of Scarabaeidae, are recently assigned four genera. Two of them, *Ankaratrotrax* Paulian, 1954 (six species) and *Manjarivolo* Paulian, 1974 (three species) are endemic for Madagascar and the adjacent islands. Distribution range of the most numerous genus, *Aulonocnemis* Klug, 1838 (42 species), is restricted almost exclusively to the Madagascar zoogeographical subregion. Only two species inhabit the Sub-Saharan Africa (Cambefort 1987). *Aulonocnemis sumatrae* Fairmaire, 1896, based on one monstrous specimen from Sumatra, has been newly transferred to the Euparini genus *Ataenius* Harold, 1867 (Cambefort 1987). Only one genus, *Palnia* Stebnicka, 1985, is at present known from the Oriental region, and comprises two species, *P. loebli* Stebnicka, 1985 and *P. stebnickae* Cambefort, 1989. Third species, *Palnia cambeforti* sp. n., discovered from the transition zone between the Palaearctic and Oriental regions, is described in the present paper.

MATERIAL AND METHODS

Specimens chosen for scanning electron micrographs were cleaned by ultrasound.

Specimens of the newly described species are provided with one red printed label *Palnia cambeforti* sp. n. HOLOTYPE, ALLOTYPE or PARATYPE with No. xx [symbol for male or female] David Král det. 1999. Exact label data are cited for the type material. Author's remarks and complementations are found in square brackets.



## SYSTEMATIC PART

### *Palnia cambeforti* sp. n.

(Figs 1–10)

**TYPE MATERIAL.** Holotype (male), allotype (female) and paratypes Nos 1–6 (not sexed), labelled China C-YUNNAN 60 km SE Kunming SHILIN (Stone Forest) lgt. D. Král 3–4/7/1990 [printed]. Holotype, allotype and paratypes Nos 1–4 in David Král collection, Praha, paratype No 5 in the collection of Muséum d'histoire naturelle, Genève, paratype No 6 in the collection of Muséum national d'Histoire naturelle, Paris.

**DESCRIPTION.** Body length 2.4–2.6 mm (HT – 2.5 mm, AT – 2.6 mm). Oblong, convex, castaneous, antennae pale, remarkably shiny (Fig. 1).

**Head** (Fig. 2). Clypeus semicircular about twice as wide as long, anterior margin not upturned, frontoclypeal suture indicated only laterally by short darkened line, gena rounded, not separated from clypeus, slightly exceeding eye laterally. Surface covered with coarse, dense, regularly distributed punctures separated by approximately their diameter; every puncture bearing very short, erect seta. Labrum (Fig. 2) with transversal row of setiferous punctures.

**Pronotum** (Figs 1, 3) subquadrate, widest approximately at middle, strongly convex especially in anterior half, except for anterior margin all around bordered. Anterior angles subacute, only slightly projecting over anterior margin, sides in anterior half almost straight and almost parallel then rounded to broadly rounded, and slightly emarginate posterior angles; emarginations and basal margin remarkably crenate and densely setaceous. Surface anteromedially covered with fine, sparsely and regularly distributed punctures, laterally and posteriorly punctation becoming gradually remarkably coarser and denser, punctures separated by approximately their diameter; every puncture bearing short erect seta.

**Scutellum** (Fig. 4) triangular, apically acute, impunctate.

**Elytra** (Figs 1, 4) almost parallel-sided, with distinct humeral denticle, slightly bordered basal margin, and 8 striae. Striae hollowed basally and apically, narrower than intervals and impunctate, striae 1–5 discally absent, stria 6 discally very finely impressed, stria 7–8 distinctly impressed along entire length, intervals basally and apically moderately convex, discally flat, with two contiguous rows of coarse punctures bearing short, erect seta.

**Macropterous.**

**Metasternal plate** flat, midline absent, remarkably coarsely punctate, each puncture bearing short, erect seta (Fig. 8). Profemora coarsely punctate, meso- and metafemora posteriorly bordered, finely, sparsely punctate (Fig. 8). Protibia laterally tridentate (Fig. 5), meso- and metatibia distally with longitudinal row of approximately 7 very short and thickened setae (Figs 6, 7).

**Abdominal sternites** remarkably coarsely punctate, each puncture bearing short, erect seta (Fig. 8).

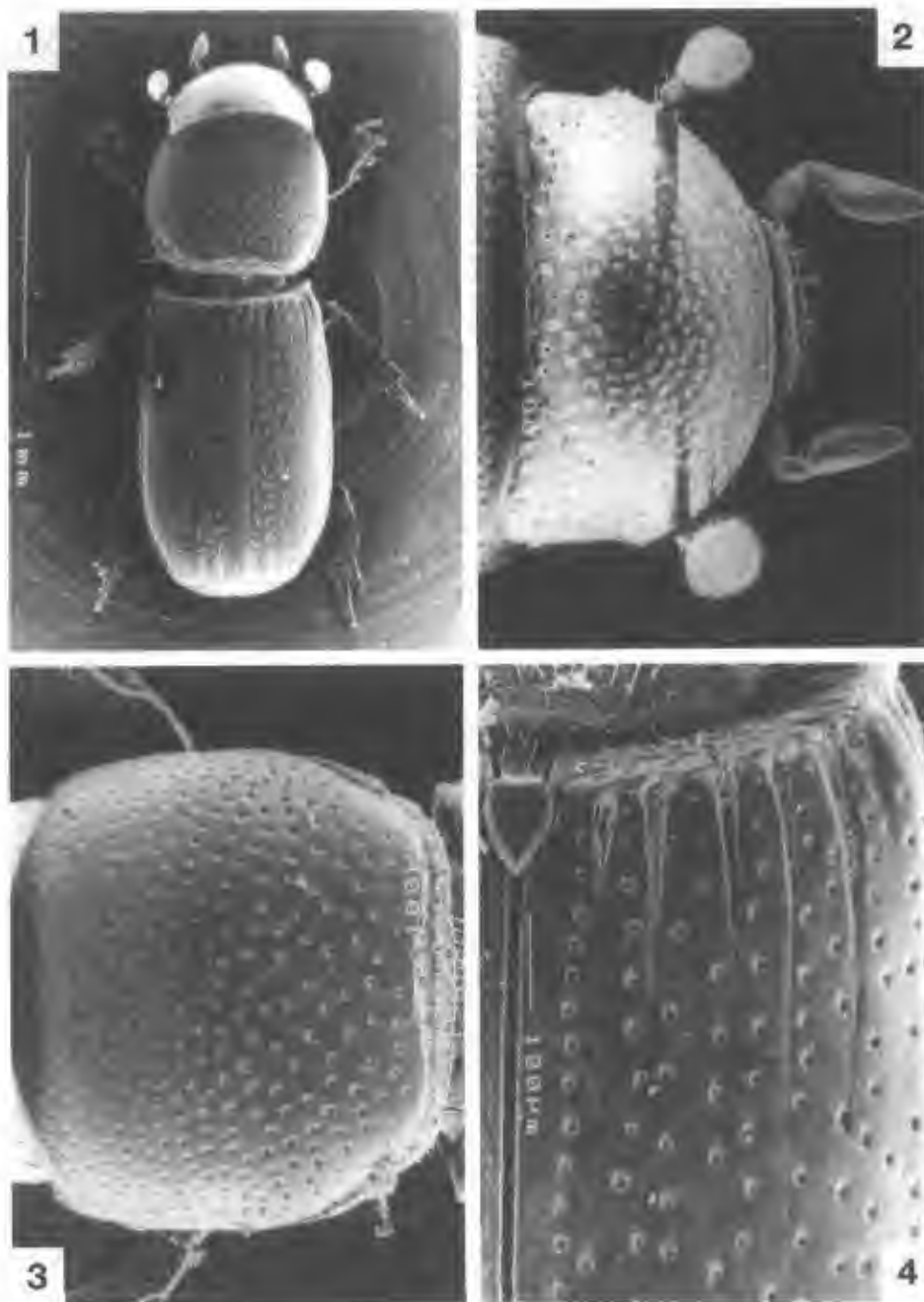
For parameres see Fig 9, 10.

**DIFFERENTIAL DIAGNOSIS.** *Palnia cambeforti* sp. n. differs from the both previously known species remarkably by having meso- and metatibia distally armed with short longitudinal row of very short, distinctly thickened setae (Figs 6, 7) while meso- and metatibia of *P. loebli* and *P. stebnicka* are unarmed distally. In addition, *P. loebli* and *P. stebnicka* are distinctly larger (3.0 mm), and in *P. loebli* abdominal sternites are only finely punctate (see Stebnicka 1985, fig 6). Parameres of both species are differently shaped as those of *P. cambeforti* sp. n. (see Figs 9, 10 and Cambefort 1989, figs 3, 4 and Stebnicka 1985, fig. 15).

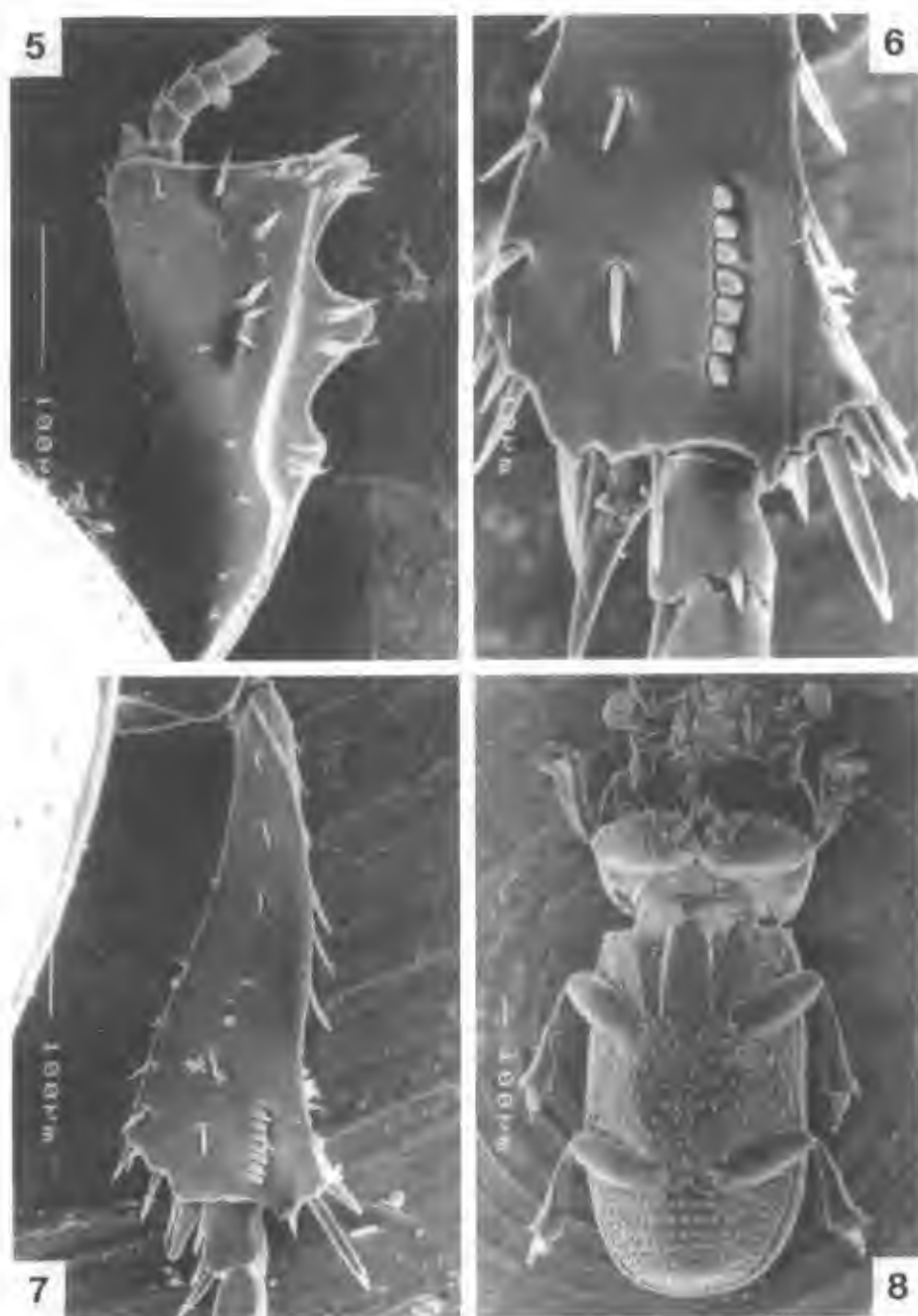
**COLLECTION CIRCUMSTANCES.** All specimens of the new species were collected at light.

**DISTRIBUTION.** China (Yunnan).

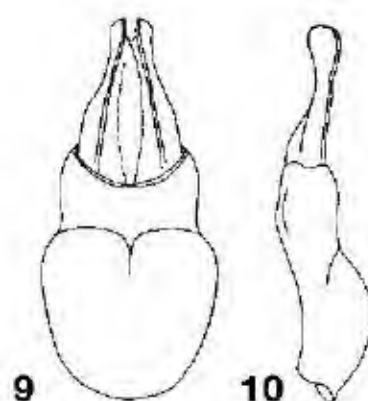
**NAME DERIVATION.** Patronymic, dedicated to my colleague Yves Cambefort (Muséum national d'Histoire naturelle, Paris), the renowned specialist on world fauna of Aulonocneminae.



Figs 1-4. *Palmis cantheforti* sp. n.: dorsal aspect of paratype No. 1. 1 - holotype, 2 - head, 3 - pronotum, 4 - basal part of right elytron.



Figs 5-8. *Paitia cambeforti* sp. n. 5 – right protibia, 6 – right mesotibia, 7 – right metatibia, 8 – habitus (5-7 dorsal aspect of paratype No. 1, 8 – ventral aspect of paratype No. 2).



Figs 9, 10 *Palnia cambeforti* sp. n., aedagus of holotype (9 – dorsal aspect, 10 – left lateral aspect)

#### Acknowledgements

Thanks are due to the following persons: Ivan Lobl (Museum d'histoire naturelle, Genève) made the *Palnia* material in his care available to study, Aleš Smetana (Food and Agriculture Canada, Ottawa) read an earlier draft of the paper and made helpful comments, Tomáš Scholz, and the staff of the Laboratory of Electron Microscopy (Institute of Parasitology, České Budějovice) helped with preparing the scanning electron micrographs. The study was supported in part by grants from the Charles University Grant Agency (GAUK 262/1999) and the Ministry of Education (MŠMT ČR J13/98113100004).

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### Three new *Tanyproctus* species from Yunnan (Coleoptera: Scarabaeidae: Melolonthinae)

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**Abstract.** The following new species of the pachydemine genus *Tanyproctus* Faldermann, 1835 from the Chinese province Yunnan are described: *T. diurnus* sp. n., *T. jizu* sp. n. and *T. nocturnus* sp. n. Their diagnostic characters (protarsomeres and parameres) are illustrated. Biological notes on e.g., time of activity (*T. diurnus* sp. n. seems to be species with strictly diurnal activity while *T. nocturnus* sp. n. is typical nocturnal species) and on mating behaviour are given.

**Taxonomy, description, binomy, Scarabaeidae, Melolonthinae, Pachydemini, *Tanyproctus*, Palaearctic region**

#### INTRODUCTION

The pachydemine genus *Tanyproctus* Faldermann, 1835 is known to have a typically disjunctive distribution. The majority of species (about 90) inhabit the Eastern Mediterranean subregion reaching Caucasus, Turkmenistan and Uzbekistan (Baraud 1985, 1987, 1992, Medvedev 1952, Nikolaev 1987) and eastern Iran and Afghanistan (Lacroix 1997, Petrovitz 1955, 1968). One species is endemic to Socotra (Lacroix 1994). The remainder of the hitherto known species are restricted to the transition zone between the Palaearctic and Oriental regions (Chang 1987, Chang & Luo 1981, Fairmaire 1886, Lacroix 1996, 1997 and Zhang & Yang 1997).

Until now, only the following five species were known from China: *T. davidis* Fairmaire, 1886 (Yunnan prov.), *T. parvus* Chang et Luo, 1981 (described from Donghai), *T. xizangensis* Chang 1987 (Xizang [= Tibet]), and *T. dechambrei* Lacroix, 1996 and *T. sanxiaensis* Zhang et Li, 1997 (both from Sichuan prov.). One species, *T. feai* Lacroix, 1997, is described from Myanmar [= Burma]. In the present paper three new species from Yunnan are described.

#### MATERIAL AND METHODS

At least five specimens, if available of each species under study, were dissected for examination of parameres.

The following codes (after Arnett et al. 1993) identify the collections housing the material examined.

- DKCP – Czech Republic, Praha, David Král collection;
- QSCR – Italy, Roma, Guido Sabatini collection;
- MIING – Switzerland, Genève, Muséum d'histoire naturelle;
- MNCP – Czech Republic, Praha, Milan Nikodým collection;
- MNHN – France, Paris, Muséum national d'Histoire naturelle;
- NMPC – Czech Republic, Praha, Národní muzeum;
- PPCB – Czech Republic, Brno, Petr Pacholátka collection;
- SMTD – Germany, Dresden, Staatliches Museum für Tierkunde.

Specimens of the newly described species are provided with one red printed label [Name of a taxon] sp. n. HOLOTYPE, ALLOTYPE or PARATYPE with No., [symbol for male or female], David Král det. 1999. Exact label data are cited for the material, all labels are printed. Author's remarks and complementations are found in square brackets.

## SYSTEMATIC PART

### *Tanyproctus diurnus* sp. n.

(Figs 2, 7, 8)

**TYPE MATERIAL.** Holotype (male), allotype (female), paratypes Nos 1–57 (males) and Nos 58–59 (females), labeled YUNNAN 2000–3000m 27 20N 100 11E HABASHAN mts NE slope 10–13/7 92 David Král leg.; paratypes Nos 60–115 (males) YUNNAN 2000–3000m 27 20N 100 11E HABASHAN mts NE slope 10–13/7 92, paratypes Nos 116–141 (males) and Nos 142–146 (females) YUNNAN cca 2000m 27 15N 100 09E HUTIAO gorge Jinsha r. 18–22 7 92 David Král leg.; paratypes Nos 147–158 (males) YUNNAN cca 2000m 27 15N 100 09E HUTIAO gorge Jinsha r. 18–22 7 92; paratype No 159 (male) China N-YUNNAN 27°18'N 100°13'E Jinsha r. vall. 1900 m, DAJU, HUTIAO gorge lgt. D. Král, 15–17/7 90. Holotype, allotype and paratypes Nos 1–24, 35–47, 58–59, 116–145 and 159 in DKCP, paratypes Nos 25–26 in GSCR; paratypes Nos 27–28 in MHNG, paratypes Nos 48–57 in MNCP, paratypes Nos 29–30 in MNHN, paratypes Nos 31–32 in NMPC, paratypes Nos 60–115 and 146–158 in PPCB, paratypes Nos 33–34 in SMTD.

**DESCRIPTION.** Body length 13.0–14.5 mm (holotype 13.5 mm, allotype 14.0 mm). Dorsal surface moderately shiny, elytron moderately shiny to alutaceous; body except for chestnut brown elytron dark brown to blackish, in some specimens (e.g., paratypes Nos 35–47) also elytron blackish. Setae pale.

Male. Body elongate, almost parallel.

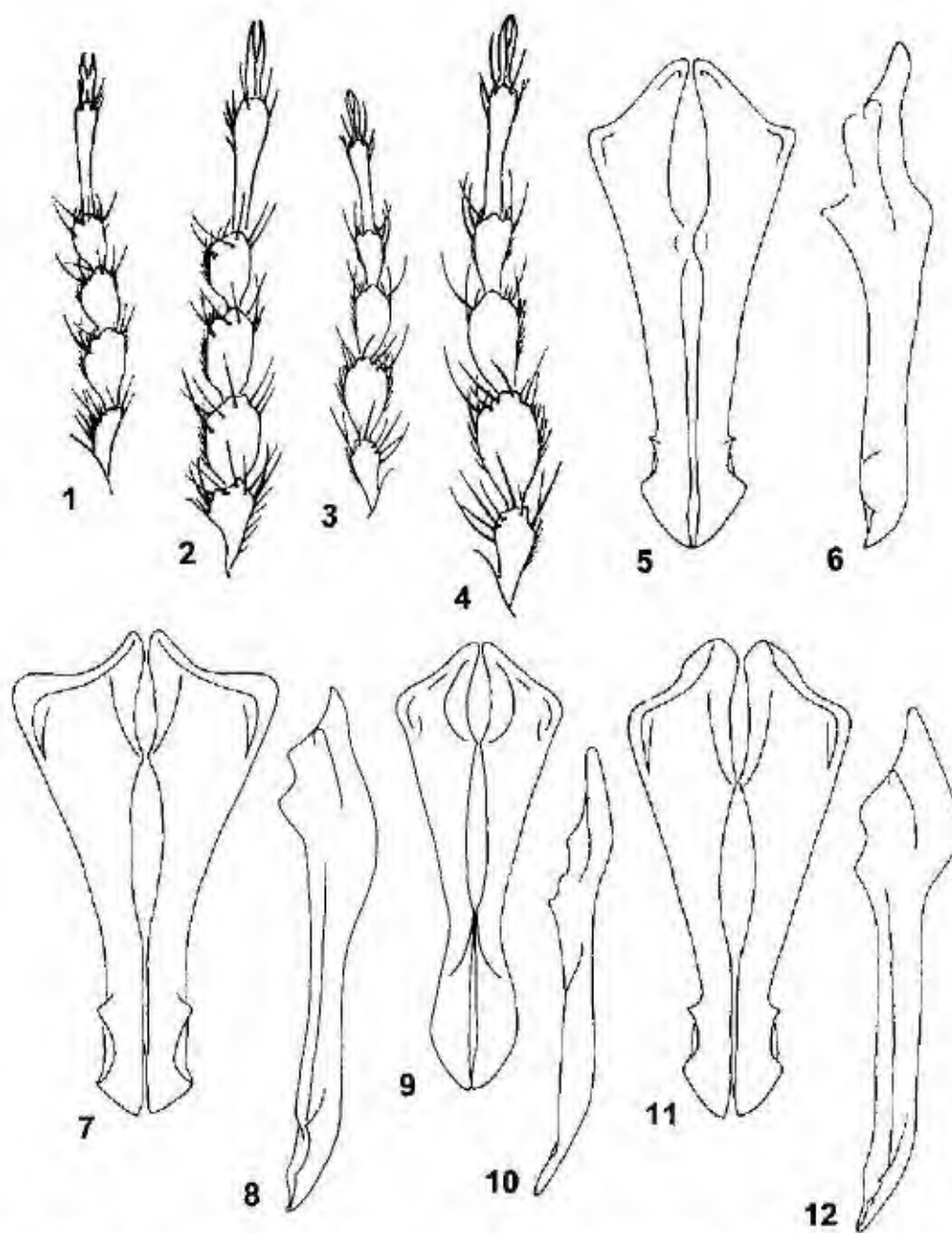
Head. Labrum small, bilobed; lobes rounded densely punctate. Outline of clypeus broadly trapezoidal with distinctly upturned margin, anteriorly slightly but distinctly emarginate, anterior angles rounded, sides weakly arcuate, anteriorly of genae slightly sinuate. Gena short, laterally rounded. Frontoclypeal suture straight or feebly arcuate, distinctly impressed. Eye relatively small, externally in dorsal aspect almost not exceeding gena; distance between both eyes in ventral aspect extended remarkably diameter of eye. Surface of clypeus and vertex bare; punctation of clypeus coarse, almost regular, punctures separated by less than their diameter or confluent; punctation of vertex approximately same as on clypeus. Antenna decamerous, antennomere 2 short, approximately as long as wide, antennomeres 3–5 elongate; club pentamerous, straight or only very slightly curved externally, shorter than antennal shaft (antennomeres 1–5 combined); antennomeres 1–5 with sparse long setae, club sparsely shortly setaceous. Terminal maxillary palpomere elongate, apically rounded, absent from depression, approximately of same length as palpomeres 2 and 3 combined.

Pronotum moderately convex, transversal, except for broad basal interruption around bordered; anterior bead narrow and flat, irregularly punctate; lateral margin remarkably crenate, with row of long setae, basal margin with row of densely distributed punctures bearing at least in posterior angles recumbent setae. Anterior angles prominent, projecting over anterior margin, acute with rounded apex, sides in approximately anterior two thirds almost straight, divergent posteriad to rounded posterior angles, posterior margin broadly bisinuate. Surface bare, microsculptured and finely, densely, almost regularly punctate, punctures separated by 2–4 their diameters.

Scutellum approximately as wide as long, triangulate, apex rounded to slightly angulate; basally with several punctures.

Elytron convex, slightly broadened posteriad, sutural angle rounded; striae except for sutural stria missing or only very feebly indicated; distinctly microsculptured and discally feebly transversally wrinkled, punctation coarse, dense, almost regular, punctures separated by 1–2 their diame-





Figs 1-12. Right male protarsomere (1-4); parameres, dorsal aspect (5, 7, 9, 11); right paramere, lateral aspect (6, 8, 10, 12) *Tithyproctus davidis* Fairmaire, Yunnan, syntypus from MNHN (1, 5, 6); *T. diurnus* sp. n., HT (2, 7, 8); *T. jizu* sp. n., HT, (3, 9, 10), *T. nocturnus* sp. n., HT (4, 11, 12).

Tab. 1 Characters separating *Tanyproctus* species known from Yunnan from each other

character	<i>T. davidis</i>	<i>T. diurnus</i> sp. n.	<i>T. jizu</i> sp. n.	<i>T. nocturnus</i> sp. n.
body length	13.5-15.0 mm	13.0-14.5 mm	12.0-13.5 mm	13.5-18.5 mm
colour of dorsal surface	unicolorous reddish brown	as a rule bicolorous	bicolorous	as a rule unicolorous
microsculpture of dorsal surface	absent	except for head microsculptured	absent	elytron, propygidium and pygidium finely microsculptured
lustre of dorsal surface	remarkable	almost alutaceous	remarkable	moderate
eye size in dorsal aspect in male	relatively small, externally almost not exceeding gena	relatively small, externally almost not exceeding gena	relatively large, externally exceeding distinctly gena	relatively large, externally exceeding distinctly gena
distance between both eyes in ventral aspect in male	extended remarkably diameter of eye	extended remarkably diameter of eye	approximately same as diameter of eye	approximately same as diameter of eye
punctuation of clypeus	coarse, irregular, punctures separated by less than their diameter or confluent	coarse, almost regular, punctures separated by less than their diameter or confluent	coarse, almost regular, punctures separated by less than their diameter	coarse, almost regular, punctures separated by less than their diameter or confluent
punctuation of vertex	finer and regularly distributed as on clypeus, punctures separated by less than their diameter	approximately same as on clypeus	finer and denser as on clypeus, punctures separated by less than their diameter	approximately same as on clypeus
shape of antennal club in male	almost straight	almost straight	distinctly curved externally	almost straight
length of antennal club in male	shorter than antennal shaft	shorter than antennal shaft	approximately as long as antennal shaft	shorter than antennal shaft
shape of protarsomeres in male	strongly widened (Fig. 1)	strongly widened (Fig. 2)	relatively less widened (Fig. 3)	relatively less widened (Fig. 4)
width-length ratio of protarsomere 2 in male	1:1.6	1:1.5	1:1.8	1:2
shape of pronotum in male	anterior half of sides almost straight	anterior two thirds of sides almost straight	anterior half of sides almost straight	anterior two thirds of sides almost straight
punctuation of pronotum	coarse, irregular, punctures separated by 1-4 their diameters	fine, regular, punctures separated by 2-4 their diameters	fine, irregular, punctures separated by 2-6 their diameters	fine, regular, punctures separated by 2-4 their diameters
punctuation of elytron	coarse, punctures separated by 1-2 their diameters	coarse, punctures separated by 1-2 their diameters	coarse, punctures separated by 1-2 their diameters	fine, punctures separated by 2-3 their diameters
shape of parameres	Figs 5, 6	Figs 7, 8	Figs 9, 10	Figs 11, 12
activity	probably diurnal species *	diurnal species	probably nocturnal species *	nocturnal species

\*1 see Discussion

ters, each puncture bearing very short, erect seta, sutural interval very slightly convex; sutural stria with row of irregularly distributed punctures; lateral margin distinctly bordered, with row of long erect setae.

**Macropterous.**

Femora shiny, irregularly punctate, punctures bearing long setae. Protibia distinctly tridentate, terminal calcar long, inserted between medial and basal dents. Meso- and metatibia slightly expanded apically, with two setiferous transversal carinae. Terminal calcars of mesotibia equal in length, flattened, apically acute. Terminal calcars of metatibia equal in length, slightly curved, acute apically. Protarsomere 2-4 (Fig. 2) strongly widened (width : length ratio of protarsomere 2 = 1 : 1.5), mesotarsomeres 2-4 only slightly dilated; pro- and mesotarsomeres 1-4 ventrally with remarkably shortly and densely setaceous pad, metatarsomeres ventrally covered with long setae. Claws bifid. Ventral surface of thorax with dense, long and recumbent setation.

Propygidium microsculptured, coarsely, sparsely and irregularly punctate; pygidium finely microsculptured, all around bordered, coarsely and irregularly punctate. Ventrites almost bare, remarkably coarsely and irregularly punctate.

**Parameres (Figs 7, 8).**

Female differs from male in the following characters: body distinctly broadened posteriorly; punctuation of vertex denser to confluent; antennomere 5 transversal, antennal club approximately as long as antennomeres 3-5 combined; pronotal sides more divergent posteriorly, elytron more broadened posteriorly, pronotal and elytral surface more finely microsculptured and therefore more shiny; metatibia strongly expanded apically; pro- and metatarsomeres not dilated and absent from setaceous pads.

**DIFFERENTIAL DIAGNOSIS.** For differential diagnosis see Table 1.

**NAME DERIVATION.** The specific name, a Latin adjective "diurnus" (diurnal), refers to time of activity of the new species.

**COLLECTION CIRCUMSTANCES.** In total 158 males and 8 females were collected. All material was found between 1900-3000 m a.s.l., preferring open, sunny habitats covered with herbal (mostly grassy) vegetation or low shrubs, exceptionally also in woody habitats (15 males from the whole number of the specimens collected). The males were observed during sunny weather to fly sporadically, from about noon, slowly and at remarkably low level (approximately 50 cm) above surface. When disturbed, they struggle to flush quickly from a range of danger. A maximum of active males were observed at about 6 p. m. when the majority of them sit on grasses and low shrubs. After 8 p. m., still before nightfall, they disappear from view (probably concealed amongst the ground vegetation). After rain, males were observed buried in shallow hollows (6 specimens). The females were found during whole the time of activity moving slowly on surface but never flying. In two cases mating was observed at a margin of dusty pathway. Copulation occurred with both individuals laying on their sides for 10 and 12 minutes respectively.

**DISTRIBUTION.** China: Yunnan.

***Tanyproctus jizu* sp. n.**

(Figs 3, 9, 10)

**TYPE MATERIAL.** Holotype and paratypes Nos 1, 2 (all males), labeled: YUNNAN 2500-2700 m 25.58N 100.21E JIZU SHAN 6-10.7.1994. Holotype and paratype No 1 in DKCP; paratype No 2 in PPCB.

**DESCRIPTION.** Male. Body length 12.0-13.5 mm (holotype 12.5 mm). Body elongate, almost parallel. Dorsal and ventral surface strongly shiny, dorsum not microsculptured; bicolorous, head pronotum and extremities dark brown, elytron light chesnut brown, ventral surface brown. Setation pale.

**Head.** Labrum small, bilobed; lobes rounded and densely punctate. Outline of clypeus broadly trapezoidal with distinctly upturned margin, anteriorly slightly but distinctly emarginate, anterior angles rounded, anteriorly of genae slightly sinuate. Gena short, laterally rounded. Frontoclypeal suture very slightly arcuate, distinctly impressed. Eye relatively large, externally in dorsal aspect exceeding gena; distance between both eyes in ventral aspect approximately same as diameter of eye. Surface of clypeus and vertex bare; punctation of clypeus coarse, almost regular, punctures separated by their diameter; punctation of vertex finer and denser as on clypeus, punctures separated by less than their diameter. Antenna decamerous, antennomere 2 short, approximately as long as wide, antennomeres 3–5 elongate; club pentamerous, distinctly curved externally, approximately as long as antennal shaft (antennomeres 1–5 combined); antennomeres 1–2 with sparse long setae, club sparsely shortly setaceous. Terminal maxillary palpomere elongate, apically rounded, absent from depression, approximately of same length as palpomeres 2 and 3 combined.

Pronotum moderately convex, transversal, except for broad basal interruption around bordered; anterior bead narrow and flat, irregularly punctate; lateral margin remarkably crenate, with row of long setae; basal margin with row of densely distributed punctures bearing at least in posterior angles recumbent setae. Anterior angles prominent, projecting over anterior margin, acute with rounded apex; sides in approximately anterior half almost straight, divergent posteriad to rounded posterior angles; posterior margin broadly bisinuate. Surface bare, finely, sparsely and irregularly punctate, punctures separated by 2–6 their diameters.

Scutellum approximately as wide as long, triangulate, apex rounded, impunctate.

Elytron convex, slightly broadened posteriad, sutural angle rounded; striae except for sutural stria missing, punctation coarse, dense and almost regular, punctures separated by 1–2 their diameters, each puncture bearing very short, erect seta; sutural interval very slightly convex, irregularly punctate; stria 1 with row of irregularly distributed punctures; lateral margin distinctly bordered, with row of long erect setae.

Macropterous.

Femora shiny, irregularly punctate, punctures bearing long setae. Protibia distinctly tridentate, terminal calcar long, inserted between medial and basal dents. Meso- and metatibia slightly expanded apically, with two setiferous transversal carinae. Terminal calcars of mesotibia equal in length, flattened, apically acute. Terminal calcars of metatibia equal in length, slightly curved, acute apically. Protarsomeres 2–4 (Fig. 3) relatively less widened (width : length ratio of protarsomere 2 = 1 : 1.8), mesotarsomeres 2–4 only slightly dilated; pro- and mesotarsomeres 1–4 ventrally with remarkable shortly and densely setaceous pad; metatarsomeres ventrally covered with long setae. Claws bifid. Ventral surface of thorax with dense, long and recumbent setation.

Propygidium coarsely, sparsely and irregularly punctate; pygidium all around bordered, and coarsely, sparsely and irregularly punctate. Ventrites almost bare, remarkably coarsely and irregularly punctate.

Parameres (Figs 9, 10).

Female unknown.

**DIFFERENTIAL DIAGNOSIS.** For differential diagnosis see Table 1.

**NAME DERIVATION.** Named after the type locality – Jizu shan Mts; noun in apposition.

**DISTRIBUTION.** China: Yunnan.

### *Tanyproctus nocturnus* sp. n.

(Figs 4, 11, 12)

**TYPE MATERIAL.** Holotype (male), allotype (female) and paratypes Nos 1–8 (males) labeled. China N-YUNNAN 27°18'N 100°13'E Jinsha r. vall. 1900 m DAJU, HUTIAO gorge lgt. D. Král, 15–17/7/90; paratypes Nos 9–44

(males) YUNNAN 2000–3000m 27 20N 100 11E HABASHAN mts NE slope 10–13/7 92 David Kral leg., paratypes Nos 45–92 (males) YUNNAN 2000–3000m 27 20N 100 11E HABASHAN mts NE slope 10–13/7 92, paratypes Nos 93–102 (males) YUNNAN ca 2000m 27 19N 100 13E SABB Jingsha r 13/7 92 David Kral leg., paratypes Nos 103–118 (males) YUNNAN ca 2000m 27 15N 100 09E HUTIAO gorge Jingsha r 18–22 7 92 David Kral leg., paratypes Nos 119–120 (males) CHINA, Yunnan prov DAJU ~ 50km N Lijiang 27.21N 100.19E 21–26 6 1993 [gt S Becvar/Bečvář] Holotype, allotype and paratypes Nos 1–33 and 93–118 in DKCP, paratypes Nos 119–120 in GSCR, paratypes Nos 33–34 in MHNG, paratypes Nos 41–44 in MNCP, paratypes Nos 35–36 in MNHN, paratypes Nos 37–38 in NMPC, paratypes Nos 45–92 in PPCB, paratypes Nos 39–40 in SMID

**DESCRIPTION** Body length 13.5–18.5 mm (holotype 17.5, allotype 14.0 mm) Dorsal surface moderately shiny, colour chestnut brown to dark brown, head, pronotum and elytral suture in some specimens (e.g., paratypes Nos 13, 27, 38) rather darker Ventral surface shiny, chestnut brown, setation pale to greyish ventrally

**Male** Body elongate, almost parallel

**Head** Labrum small, bilobed, lobes rounded densely punctate. Outline of clypeus broadly trapezoidal with distinctly upturned margin, anteriorly distinctly emarginate, anterior angles subacute, sides slightly arcuate, anteriorly of genae slightly sinuate Gena short, laterally rounded Frontoclypeal suture straight or feebly arcuate, distinctly impressed Eye relatively large, externally in dorsal aspect distinctly exceeding gena, distance between both eyes in ventral aspect approximately same as diameter of eye Surface of clypeus and vertex bare, punctation of clypeus coarse, almost regular, punctures separated by less than their diameter or confluent, punctation of vertex approximately same as on clypeus Antenna decamerous, antennomere 2 short, approximately as long as wide, antennomeres 3–5 elongate, club pentamerous, straight or only very slightly curved externally, shorter than antennal shaft (antennomeres 1–5 combined), antennomeres 1–5 with sparse long setae, club sparsely shortly setaceous Terminal maxillary palpomere elongate, apically rounded, absent from depression, approximately of same length as palpomeres 2 and 3 combined

Pronotum moderately convex, transversal, except for broad basal interruption around bordered, anterior head narrow and flat, distinctly punctate laterally, lateral margin remarkably crenate with row of long setae, basal margin with row of densely distributed punctures bearing at least in posterior angles recumbent setae Anterior angles prominent, projecting over anterior margin, acute with rounded apex, sides in approximately two anterior thirds straight to very slightly sinuate, divergent posteriorly to rounded posterior angles, posterior margin broadly bisinuate Surface bare, not microsculptured, finely, relatively sparsely and almost regularly punctate, punctures separated by 2–4 their diameters.

Scutellum approximately as wide as long, triangulate, apically rounded to slightly angulate, very sparsely punctate or impunctate

Elytron convex, only very slightly broadened posteriad, sutural angle rounded, striae except for sutural stria missing or only very feebly indicated, finely microsculptured, punctation fine and dense, almost regular, punctures separated by 2–3 their diameters, each puncture bearing very short erect seta, sutural interval very slightly convex, sutural stria with row of irregularly distributed punctures lateral margin distinctly bordered, with row of long erect setae

**Macropterous**

Femora shiny, coarsely irregularly punctate, punctures bearing long setae Protibia distinctly tridentate, terminal calcar long, inserted between medial and basal dents Meso- and metatibia slightly expanded apically, with two setiferous transversal carinae Terminal calcar of mesotibia equal in length, flattened and apically subacute Terminal calcar of metatibia equal in length, slightly curved, acute apically Protarsomeres 2–4 (Fig. 4) relatively less widened (width: length ratio of protarsomere 2 = 1:2) mesotarsomeres 2–4 only slightly dilated, pro- and mesotarsomeres



1–4 ventrally with remarkable shortly and densely setaceous pad, metatarsomeres ventrally covered with long setae. Claws bifid. Ventral surface of thorax with long, dense and recumbent setation.

Propygidium finely microsculptured, coarsely, sparsely and irregularly punctate; pygidium finely microsculptured, all around bordered, and coarsely, densely, irregularly punctate. Ventriles almost bare, remarkably coarsely and irregularly punctate.

Parameres (Figs 11, 12)

Female (allotype) differs from male in the following characters: body distinctly broadened posteriad; punctation on vertex denser to confluent; antennomere 5 transversal, antennal club approximately as long as antennomeres 3–5 combined; pronotal sides more divergent posteriad, elytron more broadened posteriad, pronotal and elytral surface more finely microsculptured and therefore more shiny; metatibia strongly expanded apically; pro- and metatarsomeres not dilated and absent from setaceous pads.

**DIFFERENTIAL DIAGNOSIS.** For differential diagnosis see Table 1.

**NAME DERIVATION.** The specific name, a Latin adjective "nocturnus" (nocturnal), refers to the time of activity of the new species.

**COLLECTION CIRCUMSTANCES.** A total of 121 males and one female were collected. All specimens were found in the same habitat as *T. diurnus* sp. n. The highest altitude they were taken from was at about 2000 m a. s. l. The beginning of activity was recorded at about 9 p. m. The males were observed moving slowly on surface or sitting on grasses and low shrubs till to about 2 a. m. They were never observed when flying. The only known female was found dead on a pathway in the early morning.

**DISTRIBUTION.** China: Yunnan.

## DISCUSSION

Two from the three above described species, *Tanyproctus diurnus* sp. n. and *T. nocturnus* sp. n., were found in the same habitat – open, sunny places covered with relatively low herbal vegetation and sparse shrubs (meadows, pastures, forest margins etc.), on the south-eastern slopes of the Habashan Mts. These two species are probably closely related (see Table 1) however they differ strongly in the times they are active. *T. diurnus* sp. n. seems to be a species with strictly diurnal activity while *T. nocturnus* sp. n. is a typical nocturnal species. Their ranges of activity probably do not overlap. Such a situation represents an interesting example of reproductive isolation between two closely related and syntopic species.

In addition, this is also correlated with size of eye. The diurnal species, *T. diurnus* sp. n., exhibits remarkably smaller eye than in the species with nocturnal activity, *T. nocturnus* sp. n. Therefore based on eye size *T. davidis* can be considered a diurnal species while *T. jici* sp. n. a species with nocturnal activity.

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**Comments on classifications of insect ontogenies, and occurrence of  
pronecometabolous wing development in termite genus *Prorhinotermes*  
(Hexapoda: Isoptera)**

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**Abstract.** The recent classification of kinds of insect metamorphoses is reviewed, commented upon, and amended. The neometabolous modes of the Thysanoptera: Tubulifera is termed diametaboly (new term), and it is argued for re-instatement of the term homometaboly for the development of the Aphidomorpha: Adelgoidea. The occurrence of neometaboly in all the higher taxa of Thysanoptera and Sternorrhyncha (except Psyllomorpha) is ascribed to an underlying synapomorphy. A special mode of development of forewing pads (separation of the latter by a sulcus from mesonotum) is identified in the Psyllomorpha, Coleorrhyncha and the most basal Heteroptera (Enicocephalomorpha: Enicocephalidae), and is termed anaptery (new term). The peculiarities of developmental pathway, wing development, and distribution, in the genus *Prorhinotermes* Silvestri, 1909 (Isoptera: Rhinotermitidae) are summarized and assessed. There is only one wing-padded instar (non-quietescent), and the development, called pronecometaboly (new term), is externally similar to the acercarian neometaboly. It is the first case of such a development among the universally hemimetabolous "polynopterian complex".

**Morphology, ontogeny, wing development, insect metamorphosis, ametaboly, prometaboly, hemimetaboly, pronecometaboly, neometaboly, remetaboly, diametaboly, allometaboly, homometaboly, parametaboly, holometaboly, anaptery, Hexapoda, Isoptera, *Prorhinotermes*, Thysanoptera, Hemiptera**

INTRODUCTION

The development of macropterous forms of pterygotan insects is usually gradual, with several juvenile instars possessing external wing pads. There are only three exceptions from this general scheme. In the Acercaria (= Paraneoptera less Zoraptera), there are several taxa with abbreviated wing development and quiescent instars (a). The particular situations in these taxa were evolved independently, but the high frequency of this phenomenon jointly with close relationship of the taxa concerned indicate common genetical background ("underlying synapomorphy" sensu Sæther 1976). The plesiomorphic situation in the Holometabola is presence of only one exopterous (and nearly always quiescent) juvenile instar – the pupa (the possible existence of several exopterous pharate pupal instars in some Strepsiptera is an apomorphy (Sehnal et al. 1996)). (b) The third exception exists in termite genus *Prorhinotermes*, in which only the last larval (= nymphal) instar possesses the wing pads (c). This has been published already by Miller (1942), but has never been noticed by general entomologists.

In this paper, we provide first the commented overview of the modern classification of insect metamorphoses, as suggested by Sehnal et al. (1996), with a special emphasis on neometabolous situations. Second, we discuss a recently neglected neometabolous condition, the homometaboly.

in some aphids, and point out a curious mode of development of wing pads shared by some non-neometabolous Acercaria. Third, we summarize the knowledge of strange developmental phenomena (and other peculiarities) occurring in the genus *Prothotermes* (Rhinotermitidae), and assess them within the context of classification of metabolous modes.

## 1. Overview of kinds of insect metamorphosis

### 1.1 Metamorphosis

The term *metamorphosis* is understood in two ways in entomology: (a) sum of all the postembryonic developmental changes terminated by appearance of sexually reproducing adult instar, or (b) an abrupt and far-reaching change in anatomy at some of the molts (b1 – applied to postembryonic development as a whole, or b2 – concerning a single organ or organ system). Sehnaal et al. (1996) have reviewed and interpreted the situation, accepted the conception (b), stressed its comprehensive aspect (b1), and classified the postembryonic developments as summarized below (rejecting many superfluous terms and categories which obscure basic situations and have limited utility only – for an outdated but up to the time complete list of terms see Handlirsch (1926)). The below review and discussion of taxonomy of the metamorphosis basically derives from that by Sehnaal et al. (1996), but in some respects modifies their views.

### 1.2 Modern classification of insect ontogenies based on Sehnaal et al. (1996)

For references to comments (1–3) see the parenthesized letters in *italic*, terminating the individual entries.

(a) AMETABOLY – no metamorphosis, adult molts present,

(a1) *Apterous ametaboly* – no wings or wing pads in juveniles and adults, no final instar (all primarily wingless insects, i.e. Collembola, Campodcina, Japygina, Archacognatha, Zygentoma, but possibly excluding the Protura) (a),

(a2) *Alate ametaboly* – at least several older juvenile instars functionally alate, adults winged, existence of final instar unknown (some extinct taxa of the Pterygota, never an extant condition),

(b) METABOLY – metamorphosis present, adults winged, no adult molts, terminal instar predetermined,

(b1) *Prometaboly* – several older juvenile instars with immobile wing pads ever increasing in size, the last juvenile (*subimago*) with functional wings (most Ephemeroptera) (b),

(b2) *Hemimetaboly* – several older juvenile instars with immobile wing pads ever increasing in size, (some Ephemeroptera, Odonata, “polyneopteran complex” *s. latiss.*, Acercaria less neometabolous groups mentioned sub b3) (c, e),

(b3) *Neometaboly* (see Table 1) – metamorphosis accompanied by striking morphogenetic changes taking place in quiescent instars and similar to those occurring in holometabolous insects, the last two juvenile instars quiescent and provided with wing pads (*parametaboly* in males of Coccothorpha, *remetaboly* type I in Thysanoptera Terebrantia), or structurally as above but quiescence involving the additional pad-less instar preceding the two wing-padded instars (*remetaboly* type II in Thysanoptera Tubulifera), or none of the juveniles provided with wing pads, and only the last juvenile instar really quiescent (*allometaboly* in the Aleocharomorpha) (Acercaria Thysanoptera and Sternorrhyncha, *partim*) (d, e),

(b4) *Holometaboly* – all but the ultimate juvenile instars without wing pads (wing rudiments present as internal invaginations or wing discs, hence the group known under the name Endopterygota as well), the last one (*pupa*) quiescent and exopterygous, provided with external immobile wings (Holometabola) (f, g). Holometabolous development differs from all the previous ones (with the exception of some neometabolans) also in absence of any external rudiments of genitalia in the juvenile instars preceding the pupa.

Table 1 Occurrence of neometaboly (N) and anaptery within the Accercaria (plesiomorphous condition = hemimetaboly, H)

---

1	Pseudocera	- H
2	Condylognatha	
2 1	Thysanoptera	
2 1 1	Terebrantia	- N <i>remetaboly</i>
2 1 2	Tubulifera	- N <i>diametaboly</i>
2 2	Hemiptera	
2 2 1	Sternorrhyncha	
2 2 1 1	Psyllomorpha	- H ( <i>anaptery</i> )
2 2 1 2	Aleyrodomorpha	- N <i>allometaboly</i>
	Aphidomorpha	Aphidoidea - H
		Adelgoidea - N <i>homometaboly</i>
	Coccoomorpha	males - N <i>parametaboly</i>
		females - H (with modifications)
2 2 2	Euhemiptera	
2 2 2 1	Cicadomorpha	<i>sed mut</i> - H
2 2 2 2	Fulgoromorpha	<i>sed mut</i> - H
2 2 2 3	Heteropterodea	<i>sed mut</i>
2 2 2 3 1	Coleorrhyncha	- H ( <i>anaptery</i> )
2 2 2 3 2	Heteroptera	
2 2 2 3 2 1	Emiccephalomorpha	Emiccephalidae - H ( <i>anaptery</i> )
		Aenictopecheidae - H
2 2 2 3 2 2	Euheteroptera	- H

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### 1 3 Comments upon the classification of insect metabolies

(a) The development of the Protura remains in too many points enigmatic, and we concur with Sehnal et al (1996) in provisionally omitting the group from classification. Adults of some non-apterygote taxa (e.g., Campodeina - Rusek pers. comm.) alternate in the adult stage reproductive and non-reproductive instars which differ structurally.

(b) We agree with those (Sehnal et al 1996) who interpret the ephemeropteran subimago as the last larval instar instead as an instar homologous to the pupa or to the first of the two adult instars.

(c) Some secondarily apterous pterygote taxa would structurally qualify for being characterized as *secondarily ametabolous* (e.g., Grylloblattodea, Phthiraptera, female Coccoomorpha). The term has been rejected since homoplasies are involved, adults do not molt, the final instar is predetermined, and only a modification of otherwise modal hemimetaboly (particularly distinct in development of grylloblattodean genitalia) is involved. Moreover we are concerned with macropterous taxa only, and the involvement of taxa with secondarily reduced or absent wings in the adult stage would unnecessarily complicate the situation.

(d) At purely descriptive level, disregarding the phylogenetic assessment, the "neometaboly" (see Table 1) covers a heterogeneous collection of situations having in common presence of 1-3 quiescent and metamorphing instars of which 0-2 are provided with wing pads (the aleyrodomorphan *allometaboly* with no wing pads in juveniles exceeds in this respect the situation obtaining in the Holometabola). The term *neometaboly* is justified, suggesting homoplastic evolution to that of the holometaboly, however, individual descriptive terms (as used above) are preferable when taxon-specific situations are considered. Taking the descriptive viewpoint, the *remetaboly* in the Thysanoptera should receive two terms "remetaboly type I" in the Terebrantia = *REMETABOLY* (two quiescent wing-padded juvenile instars), and "remetaboly type II" in the Tubulifera = *DIAMETABOLY* (new term, three quiescent juvenile instars, the two last ones with wing pads). For *homometaboly* and *anaptery* see Chapter 2.

(e) Within the hemimetabolous and neometabolous insects (mainly in the Hemiptera) there frequently occur special developmental situations associated either with peramorphic development (apomorphically earlier occurrence of wing pads), or with wing reduction in adults (delayed occurrence of wing pads). These cases do not have and do not require a special terminology, and form rather a continuum (for some aberrant situations in the Heteroptera see Štys & Davidová-Vilimová 1989).

(f) At least some species of the Strepsiptera (suborder Stylopodia) may have more than one exopterous "instars" within the pupal cuticle – for most recent discussions and the relevant literature see Sehnal et al. (1996) and Kristensen (1999). The unresolved problem is whether true pharate instars (a unique, morphologically extremely interesting reversal) or just the ecdysial cuticles (not an infrequent apomorphy) are involved.

(g) The last prepupal instar is partly quiescent in many groups of holometabolans. In many others, particularly in nest parasites and endoparasites or endoparasitoids (of both plants and animals), the individual larval instars may be strikingly structurally different (particularly if the first larva is free-living and invasive); often 1–2 larval instars may be reversibly or irreversibly quiescent. These individual situations have been variously termed, but the special names are not necessary for general developmental considerations (Sehnal et al. 1996). Admittedly, the diversity of holometabolans ontogenies is underplayed (say, against the neometabolous ones) in the above classification, but there is a good reason for it. Neometabolous ontogenies are parallelisms evolved from the hemimetaboly which is certainly a plesiomorphous situation in the modern Metapterygota (= Pterygota less Ephemeroptera), though the hemimetaboly itself is possibly a homoplasious parallelism evolved several times from alate ametaboly (Sehnal et al. 1996 based on Kukačková-Peck 1992). On the other hand, all the unusual holometabolous situations are just superimposed as homoplasious "secondary apomorphies" upon the major monophyletic "primary apomorphy", i. e. the holometaboly. Nevertheless, the unusual holometabolous ontogenies do certainly require a special terminology which should be based on comprehensive assessment of all the situations (especially in parasitoids).

## 2. Homometaboly in the Sternorrhyncha, and anaptery in the Hemiptera (Tab. 1, Fig. 1)

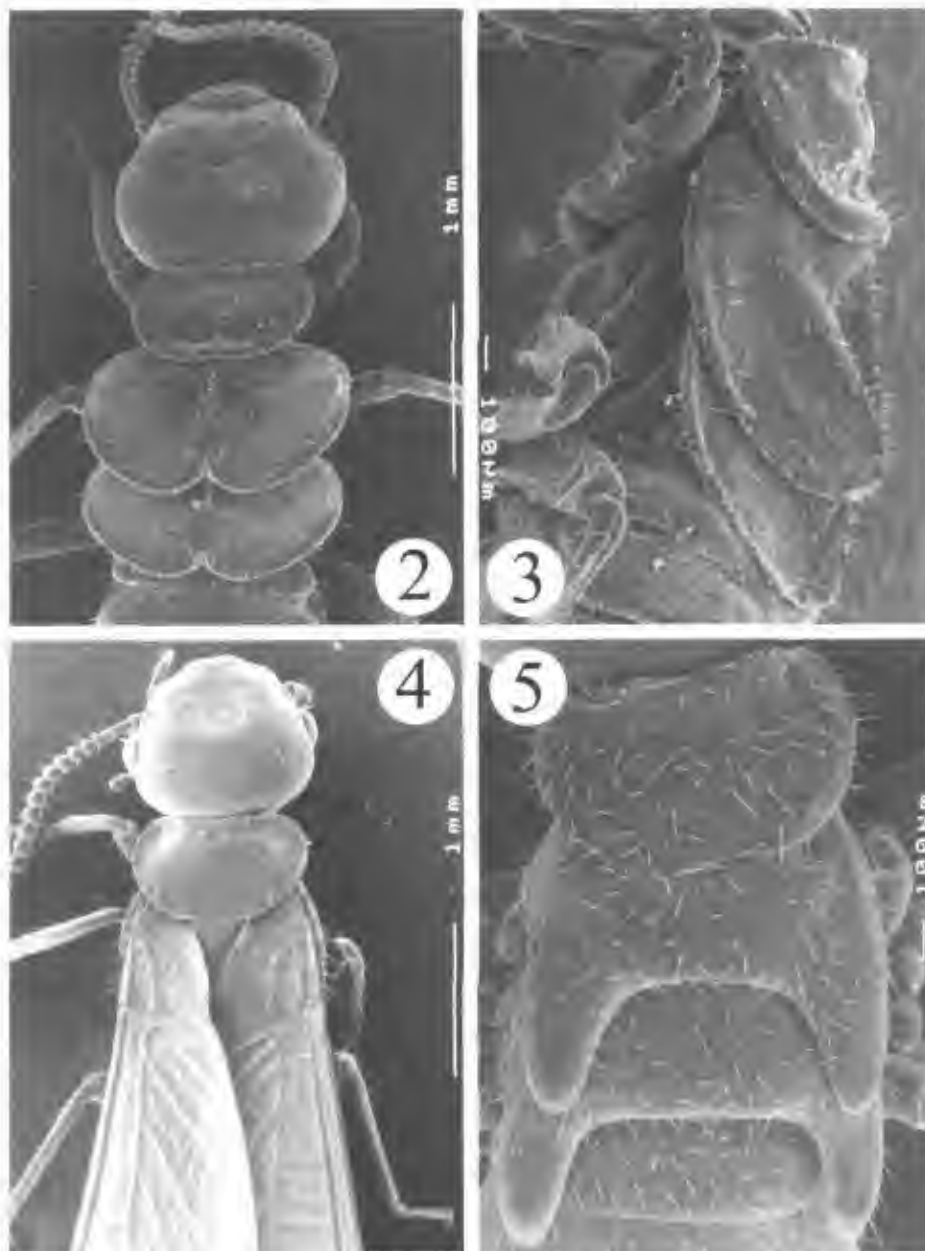
Neometabolous development includes in almost all the textbooks (e. g., Strümpel 1983) still another category in addition to *remetaboly* (incl. *diametaboly*), *parametaboly* and *allometaboly* – the *homometaboly* (term coined probably by Börner 1909 fide Handlirsch 1926). The latter term covers the situation in some aphids (Acercaria: Hemiptera: Sternorrhyncha: Aphidomorpha: Adelgoidea: Adelgidae and Phylloxeridae) in which the appearance of external wing pads of future alate females is postponed to the last (4th) quiescent juvenile instar. Contrastingly, the other aphids – disregarding their often complex life cycles and species-specific apomorphies – are hemimetabolous, and their wing pads appear earlier in the development. The category and the term has been omitted by Sehnal et al. (1996), being, perhaps, regarded as a trifle apomorphic modification of the acercarian hemimetaboly (our former opinion as well).

Now we are convinced that the *homometaboly* should be recognized as a distinct neometabolous mode. Though Sehnal et al. (1996) stressed the comprehensive aspect of the hexapodan metamorphosis, the mode of wing development still plays the major role in its classification. Homometabolous situation is clear-cut enough, and it is tempting to assess it (particularly when the existence of quiescent stages is taken into account) as an anagenetical predecessor to the aleyrodomorphan allometaboly. Recent molecular studies (Campbell et al. 1994, 1995) have suggested that the Psyllo-morpha is a sternorrhynchan sister-group to the Aleyrodomorpha + (Aphidomorpha + Cocco-morpha) while the orthodox phylogenetic hypothesis (Schlee 1969a, b) had been as follows: (Psyllo-morpha + Aleyrodomorpha) × (Aphidomorpha + Cocco-morpha). Hence the occurrence of neome-









Figs 2-5 Aspects of forewing development in the Rhinotermitidae. 2-4 *Prohomoitermes complex* (Hagen). 2 - Nymph, anterior part of body, dorsal view. The fused shield-like wing pads are distinctly visible. 3 - Nymph, thorax, lateral view. The delimitation of forewing pads already distinct (no anaptery). 4 - Alate imago, anterior part of body, dorsal view. Wings developed as in other termites. 5 - *Reticulitermes lucifugus* (Rossi), nymph, thorax, dorsal view. Wing pads developed as in other termites, and in most species of the "polyneopterian assemblage".

tably in the Sternorrhyncha other than Psyllomorpha would rather suggest an existence of a common underlying synapomorphy (*sensu* Saether 1976) rather than simple convergent homoplasy. All this seems still more intriguing regarding the universal existence of neometaboly in the Thysanoptera forming jointly with the Hemiptera a monophyletic taxon Condylgnatha. Never a genealogical link between the non-psyllomorphan Sternorrhyncha and the Thysanoptera has been suggested, but the neometabolous similarities do require an explanation.

There is also a usually overlooked similarity between basal Sternorrhyncha and the two basal clades of the Heteropterodea which deserves to be terminologically labelled. The forewing pads in the Psyllomorpha, Coleorrhyncha, Heteroptera: Enicocephalomorpha: Enicocephalidae (but not the Aenictopecheidae; all senior author pers. observ.) are delimited from the mesoscutal and mesoscutellar areas by a distinct sulcus (a peramorphic condition in comparison with the rest of the Acercaria). The latter condition is different from the modal one in the Acercaria in which the wing pads are confluent with the mesonotal area. Perhaps, the term *anaptery* [new term] could be used for the former condition. Modes of wing-pads development similar to anaptery are, of course, common in many hemimetabolous "polynopterans", but they have never been reviewed, and neither the distribution of such phenomena as anastrepsiptery (Odonata, Ensifera, Caelifera) has been explained in the phylogenetic context.

The evolutionary assessment of neometaboly and anaptery will be provided in a revision of higher classification and phylogeny of the Acercaria (senior author in prep.).

### 3. *Prorhinotermes* and its metaboly

#### 3. 1. Unique features of *Prorhinotermes* and development of its wings

Position of the genus *Prorhinotermes* Silvestri, 1909 within the Rhinotermitidae is not clear (Ahmad 1950, Krishna 1970, Ampion & Quennedey 1981), but all authors agree that *Prorhinotermes* is a very primitive member of the Rhinotermitidae. We tend to consider it (jointly with Ampion & Quennedey 1981, Roisin & Lenz 1999) as a sister group of the rest of rhinotermitids. *Prorhinotermes*

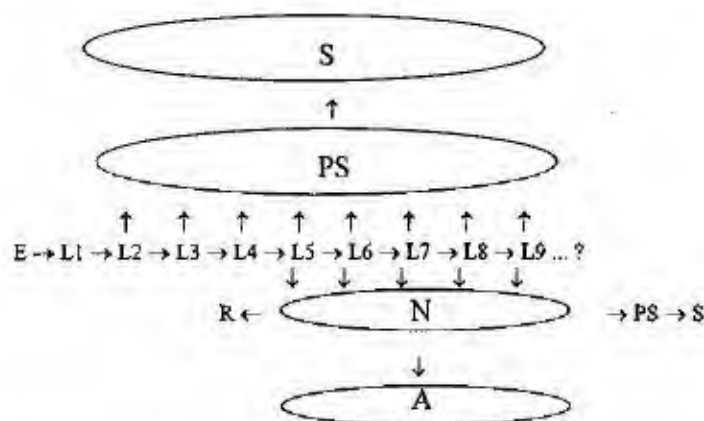


Fig. 6. All possible developmental pathways of *Prorhinotermes inopinatus* Silvestri (after Roisin 1988). The neotenic reproductives could arise from any individual in at least fourth instar (Miller 1969). Abbreviations: E – egg, L (1–9) – larva of first to ninth instar, PS – presoldier, S – soldier, N – nymph (wing-padded larva), A – alate imago, R – individual with regressed wing pads, morphologically undistinguishable from the old larvae.

differs from other rhinotermitids not only by plesiomorphic characters (presence of tergal glands in both sexes [Ampion & Quennedey 1981], the only single-site nester in the family [Shellman-Reeve 1997]) unique in the family, but also by several autapomorphies unique among all the termites. The wing pads (Figs 2–4) are not flat, but rather shield-like; the pads are short and fused together (Banks & Snyder 1920, Miller 1942); soldiers of *P. simplex* (Hagen, 1858) produce unusual defensive compound, 1-nitro-1-trans-pentadecene (Vrkoč & Ubik 1974). In most the termites, the shape of wing pads is modal (Fig. 5) for other representatives of "polyneopteran assemblage" (narrow pads extending posteriad from the meso- and meta-nota), while in *Prorhinotermes*, the pads are curved and connected apically. Another unique feature of *Prorhinotermes* is its distribution. Seventeen species of this genus (Snyder 1949, Myles 1998) are widespread on islands in tropics and subtropics, the reports from continents concern to coasts, and are very rare (Snyder 1949, Gay & Barrett 1983, descriptions of *Prorhinotermes* species from China inland remain questionable). This type of distribution indicate weak competitive abilities of this genus and capability of dispersal in floating logs or coconuts (Emerson 1955).

There is another exceptional character of some *Prorhinotermes* species. Young larvae of *P. inopinatus* Silvestri, 1909 and *P. flavus* (Bugnion et Popoff, 1910) possess strange finger-shaped appendages extending backwards from the pronotum (Roisin 1988). These appendages, which strongly resemble wing pads, usually persist until the third instar, but they could disappear after the first or further molts, persisting at most until the fourth instar (Roisin 1988). The function of these structures remains unknown. In *P. simplex*, no such appendages were observed in young larvae (F. Weyda & junior author pers. observ.).

The developmental pathways of particular castes were investigated in *P. simplex* (cf. Miller 1942) and *P. inopinatus* (cf. Roisin 1988), and it was found, that the development of castes is similar in both the species. The developmental scheme is much flexible (see Fig. 6). The individuals became active in third (smaller colonies) or fourth instar (larger colonies), and since that time they act as workers. The individuals of instars 5 and the following ones (see Fig. 6) can acquire wing pads after molting (but not necessarily) or they can become presoldiers or neotenic reproductives as well. Wing-padded individuals give rise to alate imagoes, but retain possibility of regression into apterous individuals, or into presoldiers or neotenic reproductives too. Alate polymorphism is due to origin of imagoes in different instars (Roisin 1988). The developmental pathways of *Prorhinotermes* contrast with those described in other rhinotermitids (pathways with imago line separated from worker line after the first or second molt) and is analogous to that of Kalotermitidae and Termitopsidae (at least two instars with wing pads – Shellman-Reeve 1997).

### 3. 2. *Metaboly in Prorhinotermes*

The situation in *Prorhinotermes* is reminiscent to that of *homometaboly* in the Adelgoidea – only the last juvenile instar which would molt in the functionally alate adult instar is provided with wing pads, though it is not quiescent in the former case. Surely, the phenomenon is convergent, and nothing suggests parallelism to the neometabolous modes of development in the Acercaria. However, the *Prorhinotermes* situation is the first evidence of the capacity of the "polyneopterans" to evolve the condition similar to the incipient stages of acercarian neometaboly (Fig. 1). We may call it *proneometaboly* (new term), and it may heuristically stimulate a search for similar situations among the seemingly simple hemimetabolous developments.

Interestingly, the nymphs of *Prorhinotermes* are active throughout the whole instar (junior author pers. observ.). The development of wings is usually connected with a drastic changes in morphology and anatomy. This process requires complex rebuilding of insect body, therefore the instars with rapid wing development in neometabolous and holometabolous insects are usually (but not in *Prorhinotermes*) partially or fully quiescent.

There are three aspects of the development of wings in *Prorhinotermes*, which should be regarded as unique phenomena.

(A) The absence of the "worker-soldier branch" in the development of castes of *Prorhinotermes* could be either a symplesiomorphous character (shared with some more basal groups – Termopsidae and Kalotermitidae), or it may have evolved convergently in association with specific way of wood exploitation and instability of such food sources.

(B) Abbreviation (and postponement) of wing development in *Prorhinotermes* could be associated with instability of food sources, as well as in Kalotermitidae and Termopsidae (Shellman-Reeve 1997). Why is the development of wings condensed into the only one instar cannot be hypothesized at the moment.

(C) The unique shape of wing pads in *Prorhinotermes* is not easily explained because it seems that this shape does not provide better protection against damage to the pads in comparison with their modal shape in other termites. Rather the opposite seems true: the nymphs of *P. simplex* with damaged pads were occasionally observed (junior author pers. observ.), and the damage has been similar to that described in kalotermitids by Roisin (1994).

### CONCLUSION

Taking into account the fact mentioned sub 1a, 2, and 3, we suggest the following modification of classification of insect ontogenies (Sehnal et al. 1996). New or reinstalled terms are italicized. Distribution is imposed upon a cladogram in Fig. 1.

#### 1. Ametaboly

##### 1.1. Apterous ametaboly

##### 1.2. Alate ametaboly

#### 2. Metaboly

##### 2.1. Prometaboly

##### 2.2. Hemimetaboly (some taxa with *anaptery*)

##### 2.3. *Pronemimetaboly* (in *Prorhinotermes*)

##### 2.4. Neometaboly (remetaboly in Terebrantia, *diametaboly* in Tubulifera, allometaboly in Aleyrodomorpha, *homometaboly* in Adelgoidea, parametaboly in Coccoomorpha males)

##### 2.5. Holometaboly (incl. its apomorphic conditions)

### Acknowledgements

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## Nomenclatoric and taxonomic notes on Palaearctic Phalacridae (Coleoptera)

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**Abstract** The name *Phalacrus humberti* Tournier, 1889 is stated as homonym for *P. humberti* Tournier, 1872. *P. humberti* Tournier, 1872, *P. humberti* Tournier, 1889, *P. rufipes* Tournier, 1889 and *P. quercus* Tournier, 1889 are proposed as junior synonyms of *P. coruscus* Panzer, 1797. *P. minutus* Tournier, 1889 as a junior synonym of *P. substriatus* Gyllenhal, 1813. *P. finetianus* var. *humberti* Rye, 1872, *Phalacrus humberti* Flach, 1888 and *Olibrus helveticus* Rye, 1876 are proposed as nomina nuda. The name *Phalacrus nigrinus* (Marsham, 1802) due to its priority replaces *Phalacrus caricus* Sturm, 1807. *O. sulcatus* Tournier, 1889 is proposed as a junior synonym of *O. liquidus* Sturm, 1845 and *O. bulgaricus* Reitter, 1899 as a junior synonym of *O. gerhardi* Flach, 1888. The name of *O. helveticus* Rye, 1876 is corrected as *O. helveticus* Tournier, 1876. The lectotypus of *Phalacrus quercus* Tournier, 1889. *Stilbus polygramma* Reitter, 1868, *S. meridionalis* Švec, 1992, *S. bifurcus* Švec, 1992, *S. confusus* Švec, 1992, *S. similis* Švec, 1992, *S. chomensis* Švec, 1992 and *S. interpositus* Švec, 1992 are transferred to the genus *Astenulhus* Guillebeau, 1896.

**Taxonomy, nomenclature, Coleoptera, Phalacridae, Palaearctic region**

### INTRODUCTION

Due to participating on the forthcoming Catalogue of Palaearctic Coleoptera many of the original descriptions of the Palaearctic Phalacridae as well as the types have been studied. This paper includes the results of the studies, which should be publishing ahead at last in 1999.

### MATERIAL

The paper is based mainly on the material deposited in the author's collection and also on the Swiss Phalacridae coming from the Tournier's collection deposited in the Muséum national d'Histoire naturelle, Paris (in the following text MNHP). Further the types deposited in MNHP, in the Hungarian Museum of the Natural History, Budapest (HMNH) and in the Deutsches Entomologisches Institut, Eberswalde-Finow (DEI) were examined.

The data taken from the locality labels are given with authors' remarks placed in parentheses following data mainly of the specimens labeled or believed to be types. They are concerning the way of writing of data. One of the reasons is the information personally given by Claude Besuchet (Muséum d'Histoire naturelle, Genève) that the Tournier's material housed in MNHP is not labeled by the names on pins with beetles. The names are indicated on labels fixed in entomological boxes and the beetles are stuck near them.



## RESULTS

### *Phalacrus coruscus* (Panzer, 1797)

*Amysotoma corusca* Panzer, 1797: 10

*Phalacrus Humberti* Tournier, 1872: Rye 1872: 37, **syn. n.**

*Phalacrus Humberti* Tournier, 1889: 28, **syn. n.**; **nom. n.**

*Phalacrus coruscus* var. *Humberti* Tournier, 1876: Rye 1876: 177

*Phalacrus fimetarius* var. *Humberti* Rye, 1872: Hetschko, 1930: 7, **nom. nud.**

*Phalacrus Humberti* Flach, 1888: Hetschko, 1930: 8 **nom. nud.**

*Phalacrus quercus* Tournier, 1889: 8, **syn. n.**

*Phalacrus rufipes* Tournier, 1889: 8, **syn. n.**

**MATERIAL EXAMINED.** *P. humberti* Tournier, 1889, nec 1872: 1 female, Peney, 9 Jun, Humberti type (all handwritten), Type, Muséum Paris, Coll. M. Pic/Tournier (all printed); 1 specimen (sex indet.), Peney, Muséum Paris, Coll. M. Pic/Tournier; 1 spec., Peney, 16 n 89, Muséum Paris, Coll. M. Pic/Tournier; 1 spec., B. d. Frer, 22.12.67, Muséum Paris, coll. M. Pic/Tournier; 4 spec., Peney, Muséum Paris, Coll. M. Pic/Tournier; (all deposited in MHNP under the name *humberti* Tournier n. sp.) *P. quercus* Tournier, 1889: Lectotype (here designated), female, Peney, type (handwritten), Muséum Paris, Coll. M. Pic/Tournier (printed); 1 male, B. d. Frer, 22.12.67, Muséum Paris, Coll. M. Pic/Tournier; 1 spec. (sex indet.), Saleve, 10.2.67, type dect. (handwritten), Type, Muséum Paris, Coll. M. Pic/Tournier (printed); 3 males, 1 female, Saleve, 10.9.67, Muséum Paris, Coll. M. Pic/Tournier; (all MHNP under the name *quercus* Tournier n. sp.) *P. rufipes* Tournier, 1889: female, Peney (handwritten), Muséum Paris, Coll. M. Pic/Tournier; (the specimen stuck in MHNP under label *rufipes* Tournier n. sp.)

**REMARKS.** *Phalacrus humberti*: *P. humberti* Tournier, 1872 was described in the Rye's paper (1872) as "*Phalacrus Humberti*, Tournier". In the original description it was mentioned that Tournier had examined a specimen probably coming from England which was sent to him by Rye for the determination. Tournier had recognized the specimen as a representative of valid species, new to science. According to the Article 50 (a) of the International Code of Zoological nomenclature, 1985, 3rd Edition, the species should be consider as described by Tournier with the date of the description 1872. Later Rye (1876) mentioned, that Tournier had consider the raxon for a variety of *P. coruscus* Panzer, 1797 (originally only "a variety of *coruscus*"). Till now the species was mentioned (Hetschko 1930) under the name var. *Humberti* Rye, 1872 under *P. fimetarius* (Fabricius, 1775). Hetschko (1930) listed further *P. Humberti* Flach (1888) as a junior synonym of *P. fimetarius*. This is incorrect because Flach (1889) did not describe any species under the same name but he mentioned *P. coruscus* v. *Humberti* Rye. Further Tournier (1889) described the species under the name *Phalacrus humberti*. Tournier as the author of this name was not mentioned in any of following papers. Tournier obviously based his species on the specimen sent to him by Rye for the determination, further on specimens from Switzerland cited in the material examined and also on specimens from France which are unknown to me. Tournier's specimens of *P. humberti* coming from Switzerland do not significantly differ from *P. coruscus*. Thus the nomenclatoric changes mentioned above are proposed

*P. quercus* Tournier, 1889: Among the 7 specimens of *P. quercus* housed in MHNP only the female labeled "Peney" should be considered as the type. It is designated here as the lectotype. All Tournier's specimens mentioned under material examined above including the lectotype agree well in all external characters with *P. coruscus*. Till now (Hetschko 1930) the species was listed as a junior synonym of *P. brisouti* Rye, 1872.

*P. rufipes* Tournier, 1889: Nearly certain the specimen examined is the type. It agrees well in all external characters to *P. coruscus*; thus it is proposed as a new junior synonym of the species mentioned. Till now (Hetschko 1930) it was considered for a variety of *P. fimetarius*.

***Phalacrus nigrinus* (Marshall, 1802)**

*Dermestes nigrinus* Marshall, 1802: 77.  
*Phalacrus caricis* Sturm, 1807: 80.  
*Phalacrus nigrinus* Gyllenhal, 1813: 429.

REMARKS. The name *Phalacrus nigrinus* (Marshall, 1802) replaces *Phalacrus caricis* Sturm, 1807. Balfour-Browne first stated this nomenclatoric change in 1938. Later Thompson (1958) rejected it. The evidences presented by Balfour-Browne in his paper seems to be undoubtedly correct taking into account that Balfour-Browne had identified the type of Marshall's *Dermestes nigrinus* according its number in the Stephens's collection housed in the British Museum of Natural History, London as *Phalacrus caricis* Sturm, 1807. Thompson (1958) based his rejection of the Balfour-Browne's change only on belief that the original description was not fit to the specimen of *Dermestes nigrinus* deposited under the name *Cercyon nigrinum* in the Stephens's collection and further on the information that the true type was not preserved in the collection. Thus the change of the status of *P. nigrinus* according to Balfour-Browne is again proposed.

***Phalacrus substriatus* Gyllenhal, 1813**

*Phalacrus substriatus* Gyllenhal, 1813: 428.  
*Phalacrus minutus* Tournier, 1868: 143, *syn. n.*

MATERIAL EXAMINED: *P. minutus*: female, Peney (handwritten), Muséum Paris, Coll. M. Pic/Tournier (printed) (MHNP).

REMARKS. Hetschko (1930) listed *P. minutus* as *P. substriatus* var. ? *minutus* Tourn., 1868. Although not labeled as a type, Tournier's specimen was stuck in MHNP under the name *minutus* Tourn. n. sp.. Thus the specimen is probably the type. Specimen – a female with pulled out rather damaged ovipositor – well agrees in all external characters with the original description and simultaneously with *P. substriatus*. No other specimen from the type locality labeled as *P. minutus* is present in the Tournier's collection. That is why it is proposed as a junior synonym of *P. substriatus*.

***Olibrus flavicornis* (Sturm, 1807)**

*Phalacrus flavicornis* Sturm, 1807: 78.  
*Olibrus helveticus* Tournier, 1876: Rye 1876: 177.  
*Olibrus helveticus* Rye, 1876: Hetschko, 1930: 25, *nom. nud.*

MATERIAL EXAMINED: *O. helveticus* Tournier, 1876: 1 male, 1 spec. (sex indet.), Peney, Juliet, Leontodon autumnale, Muséum Paris, Coll. M. Pic/Tournier, 1 spec., B. d. Frer, Juin 72, Muséum Paris, Coll. M. Pic/Tournier; 1 female, B. d. Bex, 17 Aout, Muséum Paris, Coll. M. Pic/Tournier, 1 male, London, Juin 72, Muséum Paris, Coll. M. Pic/Tournier; 1 male, 1 female, Peney, L. Aot., in copula, Muséum Paris, Coll. M. Pic/Tournier; 1 male, 1 female, B. d. Frer, Juin 72, type dessiné (handwritten), Type, Muséum Paris, Coll. M. Pic/Tournier (printed); (all in MHNP stuck under the name *helveticus* Tourn.).

REMARKS. Although 2 specimens were labeled as the types, the lectotype was not designated. The true type comes from Caterham.

In the original description (Rye 1876) it was mentioned that Tournier had returned to Rye a specimen coming from England under the name *Olibrus helveticus*. Rye (1876) named the species *Olibrus helveticus* Tournier. Tournier obviously had recognized the specimen as a representative of species new to science. According to the Article 50 (a) of the International Code of Zoological nomenclature, 1985, 3rd Edition, the species should be consider as described by Tournier with the date of the description 1876.

Taking into account the fact that eighth of nine of the Tournier's specimens including the specimens labeled as the types are *O. flavicornis* I propose *O. helveticus* Tournier, 1876 as a junior synonym of *O. flavicornis* (Sturm, 1807). The ninth specimen from London (Switzerland) is in fact *O. affinis* Sturm, 1807.

#### ***Olibrus liquidus* Erichson, 1845**

*Olibrus liquidus* Erichson, 1845: 111.  
*Olibrus sulcatus* Tournier, 1889: 91, **syn. n.**

MATERIAL EXAMINED. *O. sulcatus*: 1 female, Peney, 24 vii 85 (handwritten), Muséum Paris, Coll. M. Pic-Tournier (printed) (in MHNP stuck under the name *sulcatus* Tourn.).

REMARK. Tournier's *Olibrus sulcatus* labeled as the type from Peney is a monstrous specimen with deeply sulcate elytra. The author identifies it as *O. liquidus*. The species was not mentioned in any literature since the year of its original description. The unfinished Tournier's work (1889) in which *O. sulcatus* was described in a key did mention neither type locality nor number of the types. So it was not possible to verify if the example examined is the type. But there is a high probability that the data about types were never published. That is why *O. sulcatus* Tournier, 1889 is proposed as the junior synonym of *O. liquidus* Erichson, 1845.

#### ***Olibrus gerhardti* Flach, 1888**

*Olibrus gerhardti* Flach, 1888: 14.  
*Olibrus bulgaricus* Reitter, 1899: 158, **syn. n.**

MATERIAL EXAMINED. *Olibrus bulgaricus* Reitter, 1899, holotype (sex indet), Bulg. Stara Planina, leg. E. Merkl, holotypus; paratype, male, Bulg. Stara Planina, leg. E. Merkl, *Olibrus bulgaricus* Rtt. n. sp., Bulgaria, all HHNM.

REMARK. Both types of *Olibrus bulgaricus* agree well in main characters including the shape of male genitalia (examined in the paratype) with *Olibrus gerhardti*. Thus it is proposed for the junior synonym of *Olibrus gerhardti* Flach, 1888.

#### ***Astenulus polygramma* (Flach, 1888), **comb. n.****

*Stilbus polygramma* Flach, 1888: 75.

MATERIAL EXAMINED. *Stilbus polygramma* Flach, 1888: holotype, female, Syria, Kafra, Reitter (labelled by unknown entomologist as holotype); paratypes (labeled as syntypes), male, Syria, Kafra, labeled by Flach as "Typf., polygramma m."; female, Syria, (labeled by Flach as "polygramma m.") Specimen labeled as holotype deposited in HHNM, the rest in DEI. *Astenulus micropus*, Guillebeau, 1896: holotype, male, Alluand, Diego Suarez, Muséum Paris, Guillebeau, Coll. Générale, Holotype, *Astenulus micropodus* n. sp. G. (the name *micropodus* does not agree with the name *micropus* published in the original description).

REMARK. The specimen of *Stilbus polygramma* labeled as the holotype as well as the other types examined agree well in all generic significant characters with *Astenulus micropus* which is the type of the genus. Thus *Stilbus polygramma* Reitter, 1888 is transferred to the genus *Astenulus* Guillebeau, 1896.

***Astenulus meridianus* (Švec, 1992), comb. n.**

*Stilbus meridianus* Švec, 1992: 432

REMARK. The main generic characters in *Stilbus meridianus* are equal to those in the genus *Astenulus*. Thus *Stilbus meridianus* Švec, 1992 is transferred to the genus *Astenulus* Guillebeau, 1896.

***Astenulus bifurcus* (Švec, 1992), comb. n.**

*Stilbus bifurcus* Švec, 1992: 434.

REMARK. The main generic characters in *Stilbus bifurcus* are equal to those in the genus *Astenulus*. Thus *Stilbus bifurcus* Švec, 1992 is transferred to the genus *Astenulus* Guillebeau, 1896.

***Astenulus confusus* (Švec, 1992), comb. n.**

*Stilbus confusus* Švec, 1992: 436.

REMARK. The main generic characters in *Stilbus confusus* are equal to those in the genus *Astenulus*. Thus *Stilbus confusus* Švec, 1992 is transferred to the genus *Astenulus* Guillebeau, 1896.

***Astenulus similis* (Švec, 1992), com. n.**

*Stilbus similis* Švec, 1992: 436

REMARK. The main generic characters in *Stilbus similis* are equal to those in the genus *Astenulus*. Thus *Stilbus meridianus* Švec, 1992 is transferred to the genus *Astenulus* Guillebeau, 1896.

***Astenulus chinensis* (Švec, 1992), comb. n.**

*Stilbus chinensis* Švec, 1992: 438.

REMARK. The main generic characters in *Stilbus chinensis* are equal to those in the genus *Astenulus*. Thus *Stilbus chinensis* Švec, 1992 is transferred to the genus *Astenulus* Guillebeau, 1896.

***Astenulus interpositus* (Švec, 1992), comb. n.**

*Stilbus interpositus* Švec, 1992: 439

REMARK. The main generic characters in *Stilbus interpositus* are equal to those in the genus *Astenulus*. Thus *Stilbus interpositus* Švec, 1992 is transferred to the genus *Astenulus* Guillebeau, 1896.

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### In memory of Professor Sergěj Hrabě on his 100<sup>th</sup> birthday

Prof. RNDr. Sergěj Hrabě, DrSc., was born on 16 July, 1899 in Moscow and died on 29 March, 1984 in Brno.

Prof. Hrabě's parents come from Slaný in Bohemia, but they lived in Moscow. Prof. Hrabě attended elementary school in this country, but secondary school already in Moscow, where he also started his university studies. When revolution broke out in Russia, the Hrabě family returned to the newly established Czechoslovak Republic. He finished his university studies at the Faculty of Science, Charles University in Prague. After obtaining the degree of Doctor, he took a job as an assistant at the Zoological Institute of the Faculty of Science, Masaryk University in Brno. In 1933 he became associate professor and in 1938 he was to be nominated extraordinary professor. The



closing down of the universities postponed his being appointed professor until 1946 (with effect from 1945), when he became full professor of general and systematic zoology. During the occupation he worked in the Research Institute of Agriculture in Brno. In 1946, after Prof. Zavřel's death, he became head of the Zoological Institute (later the Department of Zoology and Anthropology), which function he held until the year 1970. The renewal of the institute devastated by the war required an immense activity and manysided effort of the new head.

His scientific career began as early as during his university studies in Prague, where, at the instigation of his teacher, Prof. Al. Mrázek, some groups of ring worms became the centre of his attention; he dealt above all with the families Lumbriculidae, Phreoryctidae and Naididae.

The first publications of Prof. Hrabě were based on material collected on the territory of Sub-Carpathian Ruthenia. He carried out the sampling and the procession together with his contemporary and also specialist in Oligochaeta, Dr. Černosvitov. From the Sub-Carpathian Ruthenia they described a new genus and species *Anastylus parvus* and new species *Rhynchelmus vejdvorskýi* and *Bythonomus subcarpathicus*. Besides, Prof. Hrabě collected material at numerous localities in Bohemia, Moravia and Slovakia. From those collections he described a number of new species and some genera: *Lamprodritus mrázeki*, *Stylodrilus brachystylus*, *Moraviodrilus pygmaeus*, *Tubifex moravicus*, *Trichodrilus moravicus*, *Trichodrilus tatrensis*, *Tatriella slovenica*, *Paranais friči*, *Ilyodrilus vejdvorskýi*, *Ilyodrilus mrázeki* and *Peloscolex zavřeli*.

Outside Czechoslovakia Prof. Hrabě made numerous trips abroad, particularly to the Balkans, where he obtained rich material. He devoted an extensive paper to Oligochaeta from Lakes Ochrid and Prespa (1931), where he also solved zoogeographical, phylogenetic and ecological problems: he carried out bathymetric distribution of Oligochaeta. From the taxonomic point of view he described many new species of the families Tubificidae, Lumbriculidae and Phreoryctidae. In the collections of Prof. Komárek from Lake Janina and from the Isle of Korfu he found another new genus and species *Epirodilus michaelsoni* and from the collections in Macedonia he described 7 new species. Also the lubriculid worm *Bythonomus sulci* found by Prof. Kratochvíl in the cave Pčelina pečina was described as a new species. Unique results were due to the procession of



material from the former Soviet Union from the acquisitions of the eminent limnologist, Prof. Behning which came from Lakes Chalgar, Issyk-Kul and Aral. Further he processed collections from the excursion of the Academy of Sciences, USSR, headed by the ichthyologist Prof. Berg. Various specialists sent him material for determination from other countries as well, such as Bulgaria, Romania, Iceland, the Congo, Ghana (reservoir on the Volta). Often are quoted his original papers on the fauna of marine Oligochaeta from the Black and the Mediterranean Seas. Altogether he processed biological material of Oligochaeta from 13 countries of Europe, Asia and Africa. The balance of his whole life are descriptions of 15 genera new for the science and 88 new species of Oligochaeta. The evaluation of his scientific work appeared in a six-language catalogue "Nomenclatura Oligochaetologica" by the authors J. H. Reynolds and D. G. Cook which appeared in Canada (1976). The authors of the catalogue rank Prof. Hrabě among the most eminent specialists in the group of limnic oligochaetes and they evaluate highly his share in the cognition of the hitherto almost unknown sea fauna of tubifex worms. His valuable legacy for the further generation of specialists is the monograph: *The Water Oligochaeta of Czechoslovakia* (1981), published in Czech.

From anatomic papers his study of Enchytraeidae is worth mentioning. In them he described the mouth organs and explained their function; he also solved the problem of the so-called chromophilic cells and demonstrated their importance for metabolism.

Prof. Hrabě also paid attention to further groups of invertebrate animals. With Prof. Absolon he described an interesting polychaete worm – *Marifugia cavatica* from caves in Herzegovina. From among crustaceans he dealt with Anostraca, Conchostraca, Amphipoda and Isopoda. In the High Tatras he discovered a new species for Czechoslovakia, a glacial relict – *Branchinecta paludosa*. At the Brno Reservoir he discovered another new species for Moravia – *Pectinatella magnifica*. This species was introduced to our country from North America. From the family Chironomidae he described a new species *Diamesa mohelnicensis* and he also described a new type of cysticercus found in *Lumbriculus variegatus* from Iceland.

Of fundamental importance was the publication of several volumes of "Klíč zvířeny ČSR" (The key of the fauna of the CSR) which originated at the instigation of Prof. Hrabě. He was editor of Volume I: *Klíč zvířeny ČSR I* (Key of the fauna of the CSR I) (1954), in which he processed some water groups of animals.

Besides invertebrates, Prof. Hrabě was also interested in fish, which is documented by the papers: "O potravě nejmladšího kapřího plůdku" (The food of the youngest carp fry) and "Kanibalismus kapřího plůdku" (Cannibalism of the carp fry) (together with Prof. Kostomarov). Of great importance for practical fishing was the publication of the manual "Klíč našich ryb" (Key to our fishes) (together with O. Oliva; 1953), where also the first find of the species *Proterorhinus marmoratus* on the territory of Czechoslovakia was described. This "Key" became a basis for the extended publication in the book "Stavovce Slovenska I" (The Vertebrates of Slovakia I) (together with O. Oliva and J. Lác; 1968) and for another manual "Klíč našich ryb, obojživelníků a plazů" (Key to our fishes, amphibians and reptiles) (together with O. Oliva and E. Opatrný; 1973).

Prof. Hrabě also dealt with general hydrobiological problems. From that sphere the most important is the paper "Bentická zvířena tatranských jezer" (The benthic fauna of the lakes of the Tatra Mts.) (1939) in which, on the basis of extensive material he built up his own typology of the lakes of the Tatra Mts. and objectively corrected Thienemann's distribution of lakes according to midge larvae.

Together with Prof. Zavřel, also interested in water fauna, Prof. Hrabě is one of the founders of the Brno hydrobiological school which is well known abroad.

Prof. Hrabě also paid great attention to pedagogical work. Already as an assistant of Prof. Zavřel he introduced a new branch of methodology – the microscopic technique which was an extraordi-

nary contribution to the scientific work of the graduates zoologists in the most varied biological branches. Thanks to him three university textbooks were published. He made it possible to publish the textbook *Zoologie* (Zoology) written by Prof. E. Bayer, because after the author's death he took over the edition of the book. He himself translated from Russian the textbook *Zoologie obratlovců* (Zoology of vertebrates) by S.P. Naumov (1955; 490 pages) and the textbook by V.A. Dogel devoted to the invertebrates (1961; 598 pages). The two textbooks were the only national textbooks of zoology for a long time. The pedagogical activity of Prof. Hrabě was characterized by immense accuracy, precision and didactic mastership. He laid great stress on practical identification of animals and their observation in the field. He cared for students irrespective of time and effort connected with it.

Professor Hrabě was also active in scientific and professional societies, where he worked in editorial boards, scientific commissions, etc. Thus, he was a member of the editorial board of the *Věstník československé zoologické společnosti* (The Bulletin of the Czechoslovak Zoological Society) and for many years the chairman of the Natural History Club of Brno (from 1954 after the death of J. Podpěra, a member of the Czechoslovak Academy of Sciences), where he unselfishly provided the lecturing, publication and excursion activities. The excursions organized by the "Club" were very popular with both students and the broad public.

In professional circles Prof. Hrabě was greatly esteemed. In his honour 12 taxa of the most varied animal groups were named, such as *Eophila hrabei* Černosvitov, *Beramyia hrabei* Mayer, *Spaniotoma hrabei* Pagast, *Niphargus tatrensis hrabei* Karaman, *Protonemura hrabei* Raußer, *Onychiurus hrabei* Rusek, *Hrabiella periglandulata* Pižl et Chalupský.

As an appraisal for Czechoslovak science Prof. Hrabě was awarded the memorial Gold Medal (1969) of J. E. Purkyně University in Brno, today Masaryk University, and the Order of Labour (1970).

Professor Hrabě was an exceedingly modest, immensely industrious and singularly enthusiastic scientist and university teacher who ingratiated himself with everybody listening to him.

Věra Opravilová and Edmund Sedlák

#### BIBLIOGRAPHY OF ZOOLOGICAL PUBLICATIONS BY SERGĚJ HRABĚ

##### Scientific papers

##### 1926

- Über eine neue Lumbriculiden-Art (*Rhynchelmis* Vejdovskýi n. sp.) *Zool. Anz.* 65: 265–268 (with L. Černosvitov)  
Un nouveau représentant du genre *Rhynchelmis* Hoffm. (*Rhynchelmis* Vejdovskýi n. sp.) *Věst. Král. Čes. Společ. Nauk (ř. II)* 1926: 1–12 (with L. Černosvitov)

##### 1927

- Über eine neue Lumbriculiden-Gattung *Anastylus* parvus n.g. n.sp. aus Karpathorussland. *Zool. Anz.* 71: 203–207 (with L. Černosvitov)  
*Rhynchelmis* Komáreki, eine neue Lumbriculiden-Art aus Macedonien *Zool. Anz.* 71: 170–173.

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*Lamprodrilus* mrazeki, eine neue Lumbriculiden-Art (*Oligochaeta*) aus Böhmen *Zool. Jb. Syst.* 57: 198–214.  
Zwei neue Lumbriculiden-Arten, sowie einige Bemerkungen zur Systematik einiger bereits bekannter *Zool. Anz.* 84: 9–21

- [Contribution to the knowledge of Moravian tubificids and lumbriculids] *Biol. Listy* 14: 1–6 (in Czech)  
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- 1932**  
[*Bythonomus Šulei* n. sp., un nouveau Oligochète cavernicole] *Přiroda* **25** 1-3 (in Czech)  
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[*Tubitex* (Psalmmoryetes) moravicus n. sp.] *Sbor Klubu Přír. Brno* **16** 48-52 (in Czech)
- 1934**  
*Tubitex* (Psalmmoryetes) moravicus n. sp. *Zool Anz* **107** 33-39  
Das Mundorgan von *Enchytraeus albidus*, *Achaeta bohemica* und einigen anderen Enchytraeiden *Zool Anz* **106** 245-251  
*Bythonomus Šulei*, eine neue Lumbriculiden-Art aus einer Höhle der Herzegovina *Zool Anz* **106** 314-317  
Ein neuer Fundort von *Branchinecta paludosa* (O. F. Müller) in der Hohen Tatra *Arch. Hydrobiol.* **27** 277-285  
[Über die ungeschlechtliche Vermehrung des *Bothrioneurum vejvodkyanum* Štolc] *Sbor Klubu Přír. Brno* **17** 13-18 (in Czech)  
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- 1935**  
[Über *Moravirodilus pygmaeus* n. g. n. sp., *Rhyacodrilus falciformis* Br., *Olyodrilus bavaricus* Oschm. und *Bothrioneurum vejvodkyanum* Štolc] *Spisy Přír. Fak. Univ. Brno* **209** 1-19 (in Czech)  
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- 1936**  
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*Trichodrilus Strandii* n. sp., ein neuer Vertreter der Höhlen Lumbriculiden *Festschr. Prof. Dr. E. Strand (Riga)* **1** 404-407  
[Zur Kenntnis der Oligochaeten des Aralsees] *Bull. Sci. Ac. USSR*, No. 6 1265-1276 (in Russian)  
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- 1937**  
[Zur Kenntnis des *Lamprodilus mrázeki* Hr., *Aulodrilus plurisetus* Pig. und *Aulodrilus pigueti* Kow.] *Sbor Klubu Přír. Brno* **19** 3-9 (in Czech)  
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- 1938**  
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[Beitrag zur Kenntnis der Oligochaetenfauna Böhmens] *Sbor Klubu Přír. Brno* **21** 1-8 (in Czech)
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[Über die ontogenetische Entwicklung des männlichen Ausführungsganges bei einigen Oligochaeten] *Sbor Klubu Přír. Třebíč* **3** 56-65 (in Czech)  
[Über die Bodenfauna der Seen in der Hohen Tatra] *Sbor Klubu Přír. Brno* **22** 1-13 (in Czech)

- 1941**  
[Zur Kenntnis der Oligochaeten aus der Donau] *Práce Mor Pŕir Spol.* **13**: 1–36 (in Czech)
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